Workshop Manual

Audi A3 2004 ➤
Audi A3 Cabriolet 2008 ➤
Audi A3 Sportback 2005 ➤

4-cylinder TDI engine (2.0 ltr. 4-valve common rail), mechanics									
Engine ID	CBA A	CBA B	CBB B	CBE A					

Edition 10.2019

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10 - Removing and installing engine
13 - Crankshaft group
15 - Cylinder head, valve gear
17 - Lubrication
19 - Cooling
21 - Turbocharging/supercharging
26 - Exhaust system

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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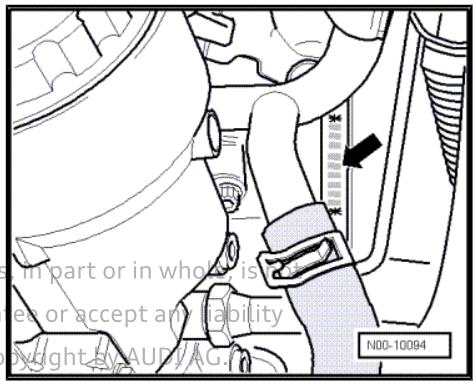
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00 – Technical data

1 Engine number/engine data

(ARL006694; Edition 10.2019)

Engine number



- The engine number (“engine code” and “serial number”) -arrow- can be found at the front of the joint between engine and gearbox.
- There is also a sticker with “engine code” and “serial number” attached to the toothed belt cover.
- Engine codes starting with the letter “C” have four letters (previously three letters).
- The first 3 characters of the engine code stand for the engine capacity and the mechanical construction and design. They are stamped onto the cylinder block together with the serial number.
- The 4th character indicates the power output and torque of the engine and is determined by the engine control unit.

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Note

- *The four-letter engine code is found on the type plate (certain countries only), vehicle data sticker and engine control unit.*
- *Fitting locations of the type plate (certain countries only) and the vehicle data sticker ⇒ Maintenance ; Booklet 808*

For engine data refer to ⇒ Technical data for engines; Rep. gr. 00 ; Overview of engines .

2 Safety precautions

Overview

- ⇒ “2.1 Working on the fuel system”, page 2
- ⇒ “2.2 Working on the cooling system”, page 3
- ⇒ “2.3 Working on vehicles with start/stop system”, page 3
- ⇒ “2.4 Using testers and measuring instruments during a road test”, page 4
- ⇒ “2.5 Safety precautions when working on the exhaust system”, page 4

2.1 Working on the fuel system

When working on the fuel system note the following warnings:

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WARNING

Fuel under pressure - risk of injuries!

- ***Put a clean cloth around the connection before opening the fuel system. Then carefully loosen the connection to relieve the pressure.***
- ***Put on protective gloves.***
- ***Put on safety goggles.***

Very hot fuel - risk of burn injuries!

- ***After switching off the engine, the temperature of fuel pipes and the fuel itself can be up to 100 °C in extreme cases. Let fuel cool off before opening any connections; otherwise there is a danger of scalding!***
- ***Put on protective gloves.***
- ***Put on safety goggles.***

Observe the following points to prevent personal injuries and damage to the injection and glow plug system:

- Always switch off the ignition before connecting or disconnecting tester cables or electrical wiring for the injection or glow plug system.
- Always switch off ignition before washing engine.
- Faults are stored in event memory of engine control unit if electrical connectors were unplugged and the engine was started: `Interrogate event memory` in `Vehicle self-diagnosis` ⇒ Vehicle diagnostic tester.

Caution

When disconnecting the battery there is a risk of irreparable damage to electronic components.

- ***Observe notes on procedure for disconnecting the battery.***
- ***Always switch off the ignition before disconnecting the battery.***

– Disconnect battery ⇒ Electrical system; Rep. gr. 27 .

2.2 Working on the cooling system

When working on the cooling system note the following warnings:

WARNING

Risk of scalding due to hot steam and hot coolant.

- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

Risk of injury as the radiator fans may start up automatically.

- *Unplug electrical connectors before working in vicinity of radiator cowl.*

Caution

Overheating can occur if the filler cap is not fitted properly.

- *Close filler cap on coolant expansion tank (make sure it engages).*

2.3 Working on vehicles with start/stop system

Please note the following when working on vehicles with start/stop system:

WARNING

Risk of injury due to automatic engine start on vehicles with start/stop system.

- *On vehicles with activated start/stop system (indicated by a message in the instrument cluster), the engine may start automatically if it needs to.*
- *Therefore it is important to ensure that the start/stop system is deactivated when performing repairs (switch off ignition, if required switch on ignition again).*

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2.4 Using testers and measuring instruments during a road test

Note the following if testers and measuring instruments have to be used during a road test:

WARNING

Accidents can be caused if the driver is distracted by test equipment while road-testing, or if test equipment is not properly secured.

Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*
- *Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.*

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2.5 Safety precautions when working on the exhaust system

WARNING

Please note the following warnings when working on all parts of the exhaust system:

- *Wear gloves (e.g. rubber, not textile) and safety goggles to avoid contact with eyes and skin - risk of injury.*
- *Do not dismantle exhaust gas temperature sender - risk of injury.*

Caution

Risk of damage to flexible joint.

- *Do not bend flexible joint more than 10°.*
- *Install flexible joint so that it is not under tension.*
- *Take care not to damage wire mesh on flexible joint.*

3 General repair instructions

Overview

- ⇒ “3.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger”, page 5
- ⇒ “3.2 Checking for leaks in the fuel system”, page 5
- ⇒ “3.3 Bolts/nuts”, page 6
- ⇒ “3.4 Identification plates”, page 6
- ⇒ “3.5 Use of impact wrenches”, page 6
- ⇒ “3.6 Foreign particles in engine”, page 7
- ⇒ “3.7 Contact corrosion”, page 7
- ⇒ “3.8 Routing and attachment of pipes, hoses and wiring”, page 7
- ⇒ “3.9 Installing radiators, condensers and charge air coolers”, page 7
- ⇒ “3.10 Checking vacuum system”, page 8

3.1 Rules for cleanliness when working on fuel supply system, injection system and turbocharger

Even small quantities of dirt can lead to defects. For this reason, please observe the following rules when working on the fuel supply system, injection system and turbocharger:

- Clean connections and surrounding area thoroughly with engine cleaner or brake cleaner and dry cleaned area before loosening.
- Seal off open pipes/lines and connections immediately with clean plugs, e.g. from engine bung set - VAS 6122- .
- After removal, place parts on a clean surface and cover them. Only use lint-free cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have not been stored in the proper packaging (e.g. in tool boxes etc.).
- Do not work with compressed air when the system is open. If possible, do not move vehicle.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

3.2 Checking for leaks in the fuel system

– Start the engine and let it run at medium speed for a few minutes.

– Switch off ignition.

– Check the entire fuel system for leaks.

– If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.

– Then carry out a test drive with at least one full-power acceleration.

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– Then check high-pressure part of fuel system again for leakage.

3.3 Bolts/nuts

- Loosen bolts in reverse sequence to specified tightening sequence.
- Bolts and nuts used to secure covers and housings must be tightened in steps according to the specified tightening sequence and method.
- Bolts and nuts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- Always renew self-locking bolts and nuts.
- Unless otherwise specified, use a wire brush to clean the threads of bolts which are secured with locking fluid. Then install bolts with locking fluid; for locking fluid refer to ⇒ Electronic parts catalogue .
- Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned using a thread tap or similar. Otherwise there is a danger of the bolts shearing off the next time they are removed.
- The tightening torques stated apply to non-oiled nuts and bolts.

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3.4 Identification plates

When renewing vehicle components, the identification plates on the old parts that have a replacement part number (see ⇒ Electronic parts catalogue) must be attached to the new parts due to approval regulations.

3.5 Use of impact wrenches

In general, it is permitted to use an impact wrench to unscrew bolts and nuts. An exception to this is when work is performed inside an open high-voltage battery. For this work, it is not permitted to use an impact wrench.

An impact wrench may be used to screw in bolts and nuts when performing repair work if the following requirements are observed. In general, electric and compressed-air impact wrenches should be used.

Requirements:

- Only screw in bolts with locking fluid or self-locking nuts at low speed.
- Use a suitable impact wrench with variable speed and adjustable torque range.
- Use suitable bits when working in the vicinity of sensitive surfaces, e.g. plastic-coated bits for aluminium rims.
- When working in the vicinity of natural gas systems, observe the information in the Workshop Manual “Natural gas engines - General information”.

Use:

- Fit bolts/nuts by hand.

- Only use an impact wrench to screw in bolts/nuts until the head of the bolt/nut makes contact and then continue tightening with a torque wrench.
- Clean threaded pins before unscrewing the bolt/nut.

3.6 Foreign particles in engine

When working on the engine, all open inlet and exhaust ports must be sealed with suitable plugs (e.g. from engine bung set - VAS 6122-) to prevent foreign particles from entering the engine.

Note

If the turbocharger has suffered mechanical damage
⇒ page 240

3.7 Contact corrosion

Contact corrosion can occur if unsuitable fasteners are used (e.g. bolts, nuts, washers, etc.).

For this reason, only fasteners with a special surface coating are fitted.

Additionally, all rubber and plastic parts and all adhesives are made of non-conductive materials.

Always install new parts if you are not sure whether used parts can be re-fitted ⇒ Electronic parts catalogue .

Please note:

- We recommend using only genuine replacement parts; these have been tested and are compatible with aluminium.
- We recommend using Audi Genuine Accessories.
- Damage caused by contact corrosion is not covered by warranty.

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3.8 Routing and attachment of pipes, hoses and wiring

- Mark fuel lines, hydraulic lines, vacuum lines, lines for activated charcoal filter and electrical wiring etc. before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.
- Because of the limited space in the engine compartment, it is important to ensure that there is adequate clearance to any moving or hot components to avoid damage to lines and wiring.

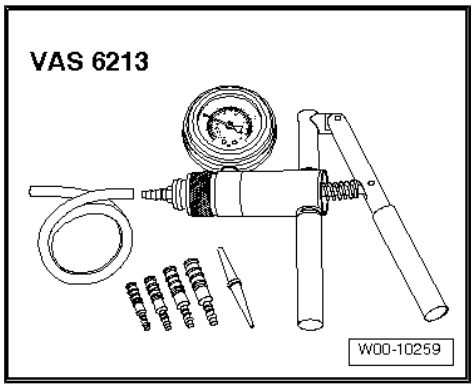
3.9 Installing radiators, condensers and charge air coolers

Even when the radiator, condenser and charge air cooler are correctly installed, slight impressions may be visible on the fins of these components. This does not mean that the components are damaged. If the fins are only very slightly distorted, this does not justify renewal of the radiator, charge air cooler or condenser.

3.10 Checking vacuum system

Special tools and workshop equipment required

- Hand vacuum pump - VAS 6213-



Procedure

– Check all vacuum lines in the complete vacuum system for:

- Cracks
- Traces of animal bites
- Kinked or crushed lines
- Porous or leaking lines

– Check vacuum line to solenoid valve and from solenoid valve to corresponding component.

– If a fault is stored in the event memory, check the vacuum lines leading to the relevant component and also check the remaining vacuum lines in the system.

– If it is not possible to build up a vacuum with the hand vacuum pump - VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

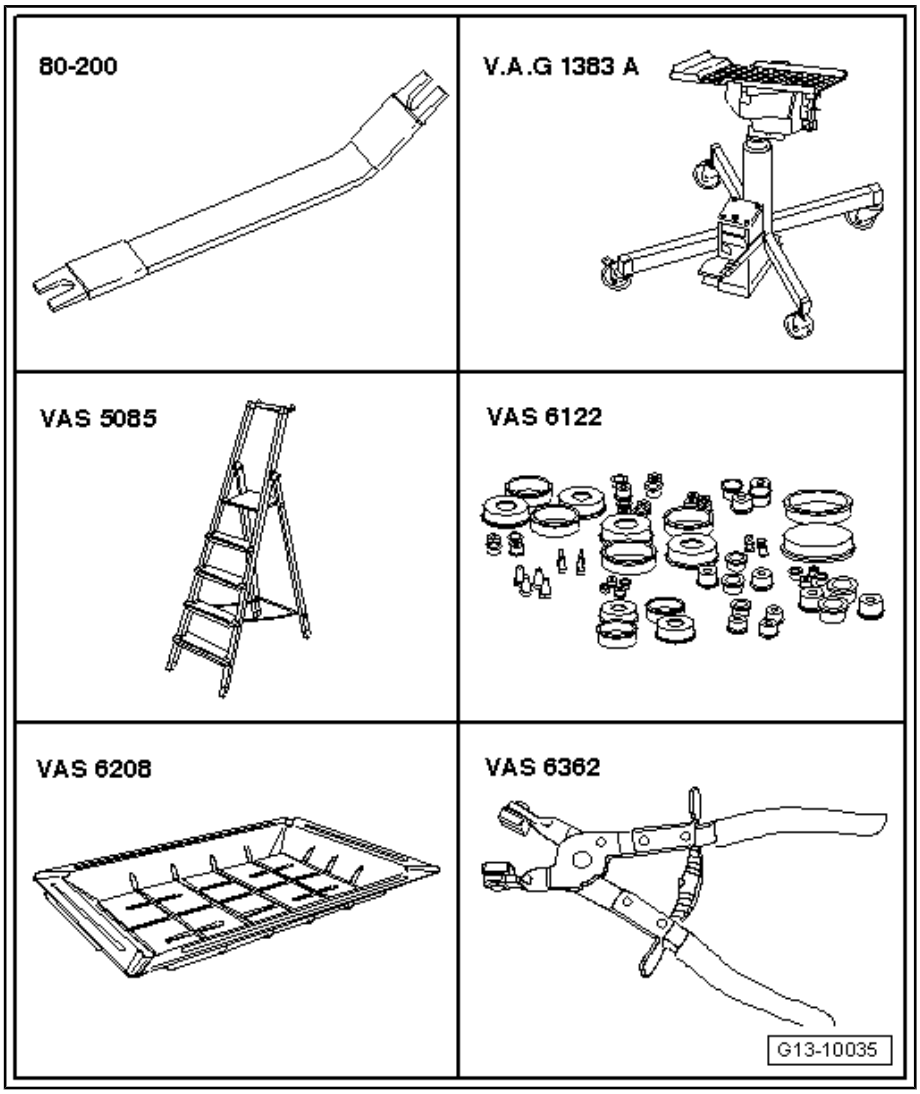
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10 – Removing and installing engine

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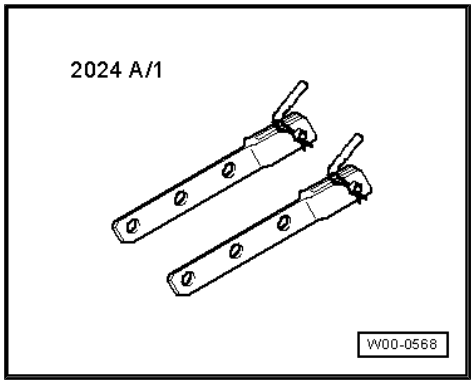
1 Removing engine

Special tools and workshop equipment required

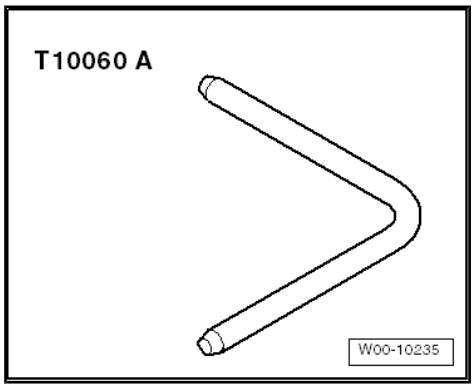


- Removal lever - 80 - 200-
- Engine and gearbox jack - V.A.G 1383 A-
- Stepladder - VAS 5085-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-

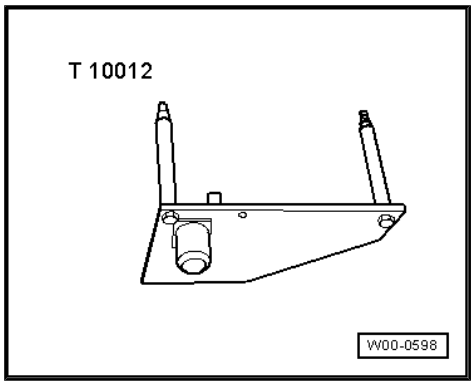
- Hooks -2024 A /1- of lifting tackle - 2024 A- for vehicles with four-wheel drive



- Locking pin - T10060 A- for vehicles with air conditioner compressor and tensioner



- Engine bracket - T10012-



- Safety goggles
- Protective gloves

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Procedure

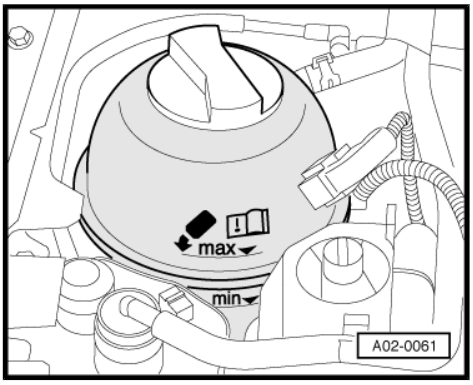
Note

- *The engine is removed from underneath together with the gearbox.*
- *Fit cable ties in the original positions when installing.*
- *Fit heat insulation sleeves in the original positions when installing.*

WARNING

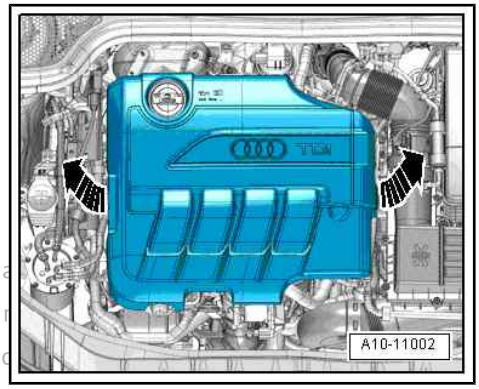
Risk of scalding due to hot steam and hot coolant.

- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*



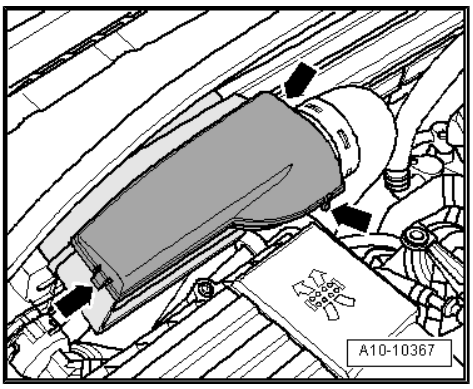
– Open filler cap on coolant expansion tank.

– Remove engine cover panel -arrows-.

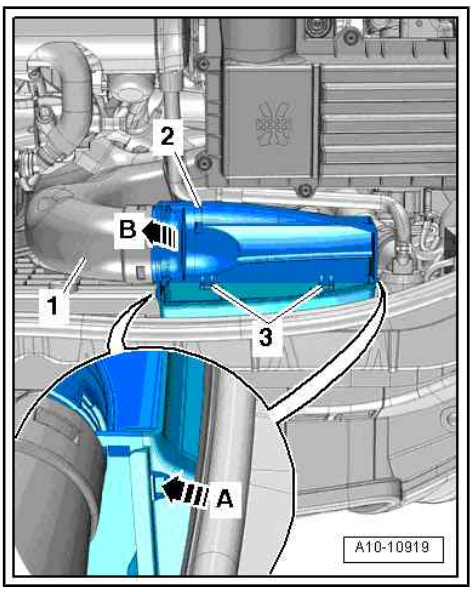


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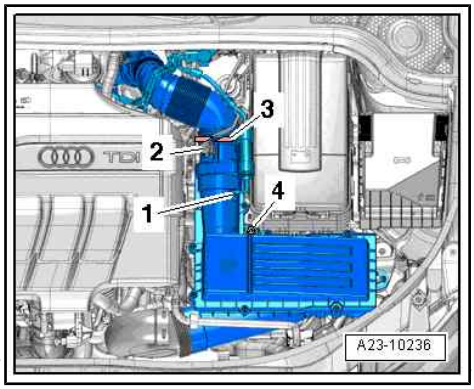
– Pull cover off air duct (release clips on sides) -arrows-.



– Release clips on left and right -arrow A- and unclip air duct at bottom -2-.
– Swivel air duct (bottom) slightly to the rear and detach air duct (bottom) from retainers -3-.
– Detach air pipe -1- from air duct (bottom) -arrow B-.

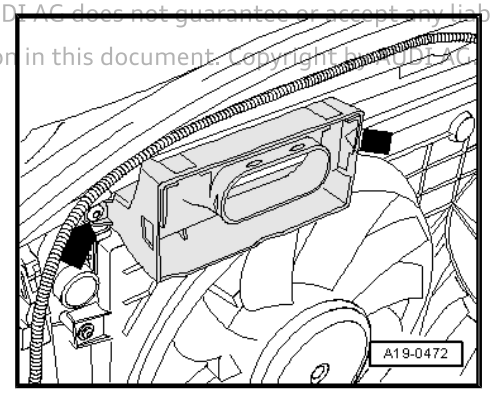


– Unplug electrical connector -2- at air mass meter - G70- .
– Detach hose -1-.
– Release hose clip -3- and detach air hose.
– Unscrew bolt -4- and remove air cleaner housing.



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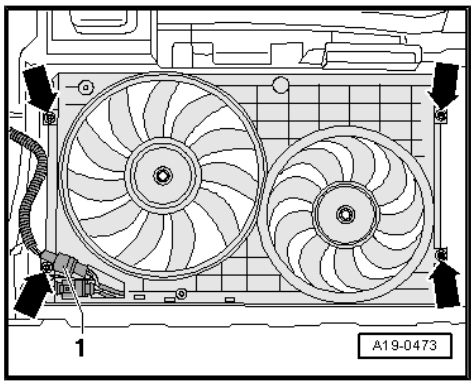
– Remove bolts -arrows- and detach air duct from lock carrier.



WARNING

Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

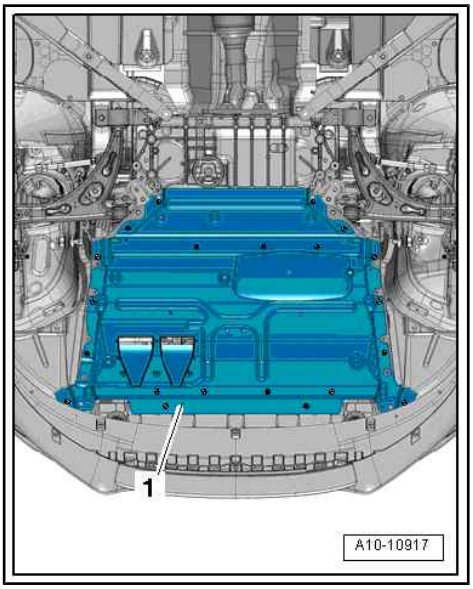


– Remove bolts -top arrows- for radiator cowl.

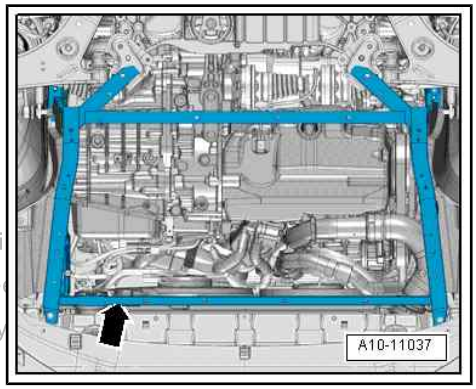
Note

- *The bolts -bottom arrows- are removed at a later stage.*
- *Disregard -item 1-.*

– Remove both front wheels.
– Remove noise insulation -1- ⇒ Rep. gr. 50 .

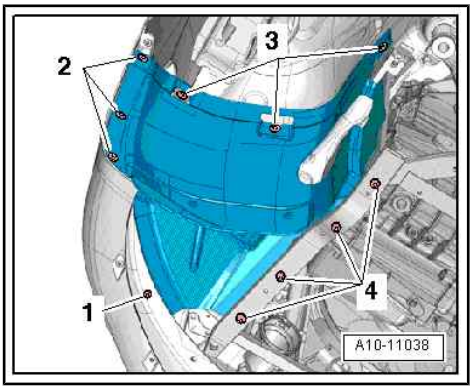


– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .

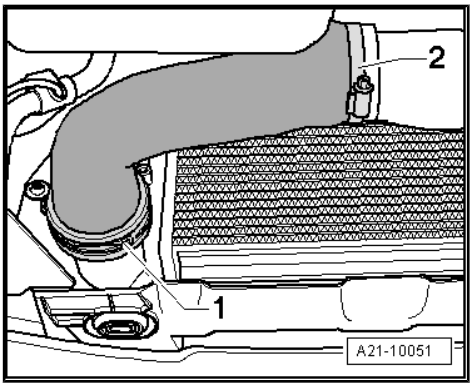


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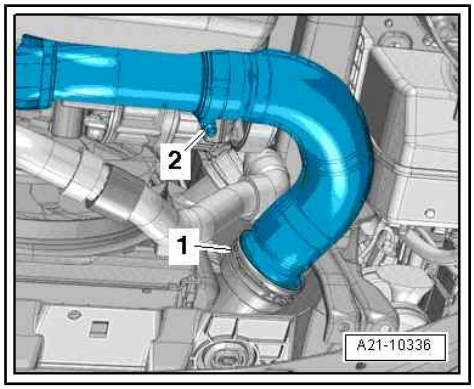
– Remove front left and front right wheel housing liners (front section) ⇒ Rep. gr. 66 .



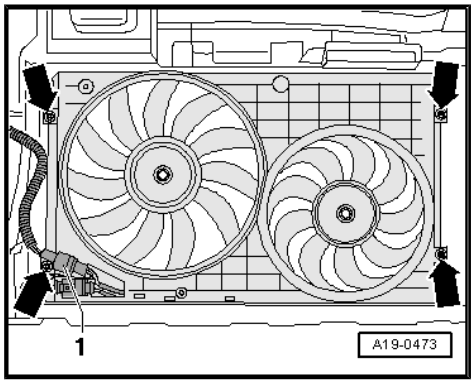
– Release hose clip -2-, lift retaining clip -1- and remove air hose.



– Release hose clip -2-, lift retaining clip -1- and remove air hose.
– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .



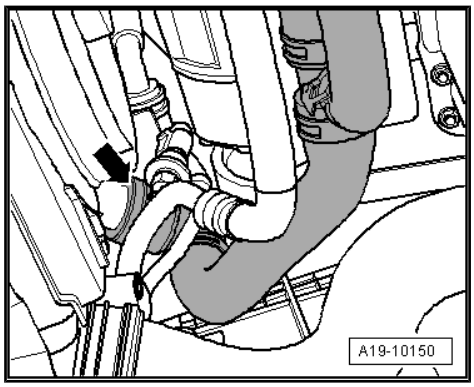
– Unplug electrical connector -1-.
– Remove bolts -bottom arrows- and take out air cowl downwards.



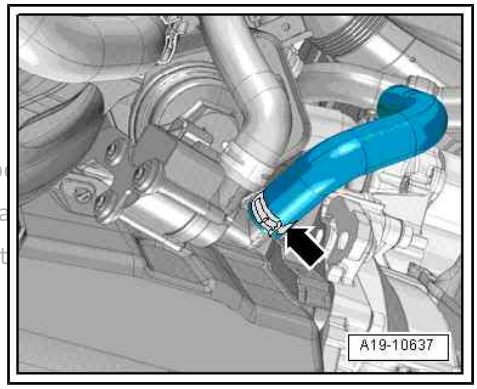
Note

Collect drained coolant in a clean container for re-use or disposal.

– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Lift retaining clip -arrow-, disconnect coolant hose (bottom right) from radiator and drain off coolant.

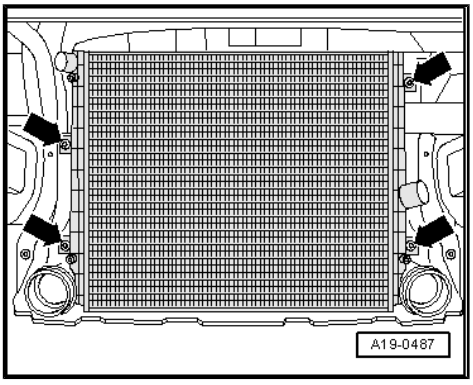


– Open hose clip -arrow-, disconnect coolant hose (bottom) leading to pump for exhaust gas recirculation cooler - V400- and drain off coolant.



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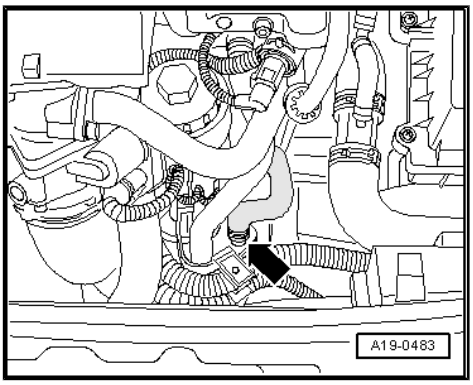
– Remove bolts -bottom arrows- on rear side of radiator.



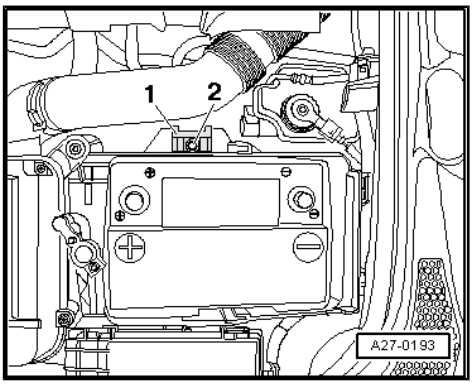
Note

The bolts -top arrows- are removed at a later stage.

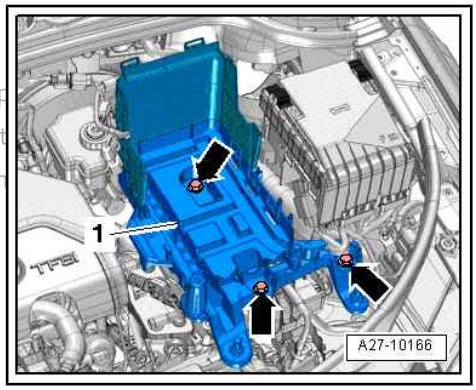
– As an additional step, open hose clip -arrow-, disconnect coolant hose at top of engine oil cooler and drain off remaining coolant.



– Remove battery ⇒ Electrical system; Rep. gr. 27 .

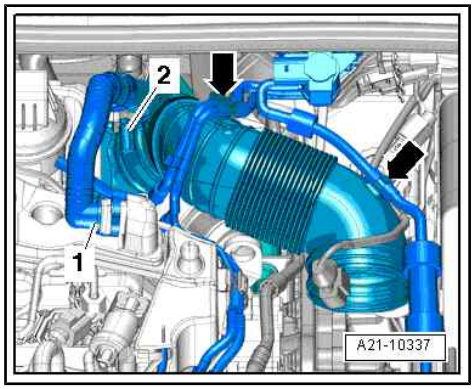


– Remove bolts -arrows- and take out battery tray -1-.



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– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows- at air pipe.
– Loosen hose clip -2- and detach air pipe.

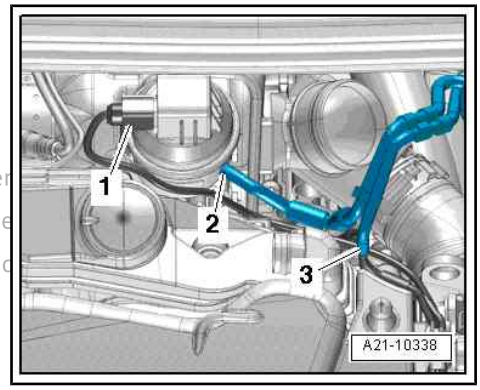


– Detach vacuum hose -2- from vacuum unit of turbocharger.
– Disconnect vacuum hose -3-.

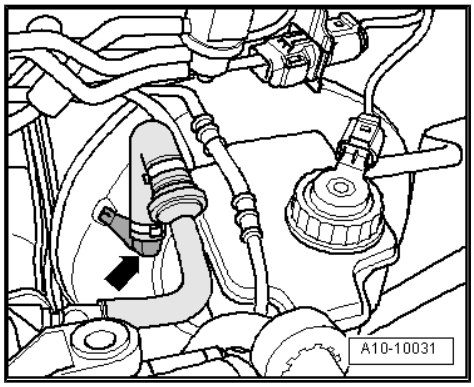
Note

Disregard -item 1-

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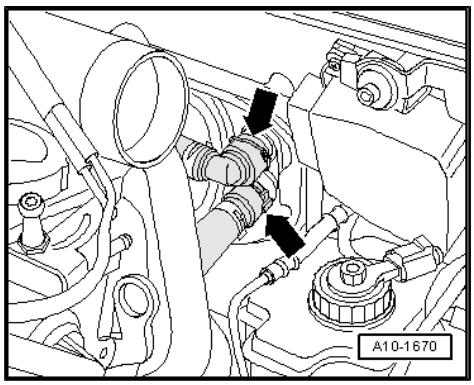
– Detach vacuum hose from brake servo -arrow-.



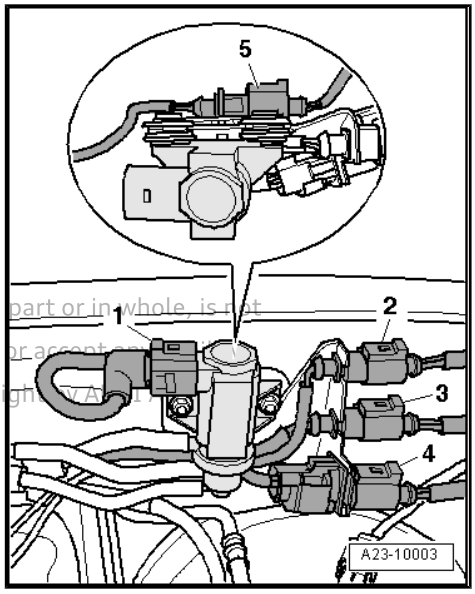
Note

Place a cloth underneath heat exchanger for heater to catch escaping coolant.

– Lift retaining clips -arrows- and disconnect coolant hoses from heat exchanger for heater.



– Detach electrical connectors -3- from bracket and unplug.
– Move clear electrical wiring -2-3-4-5-.

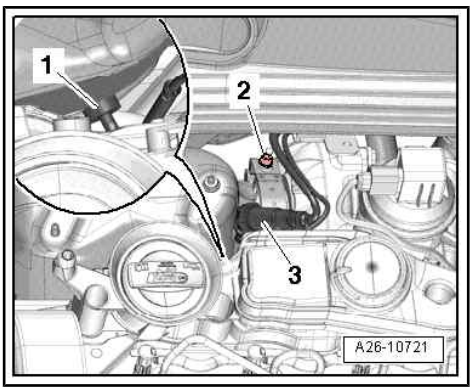


Note

Disregard -item 1-.

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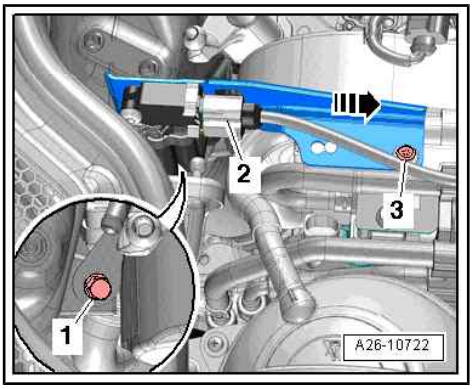
– Detach clamp -2-



Note

Disregard items -1 and 3-.

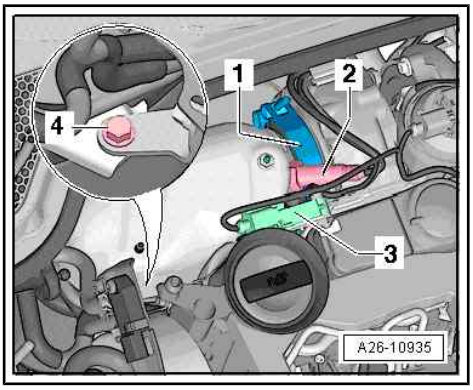
– Unplug electrical connector -2- on exhaust gas pressure sensor 1 - G450- .
– Remove bolt -3- and detach exhaust gas pressure sensor 1 - G450- from bracket -arrow-.
– Remove top bolt -1- at bracket for particulate filter.



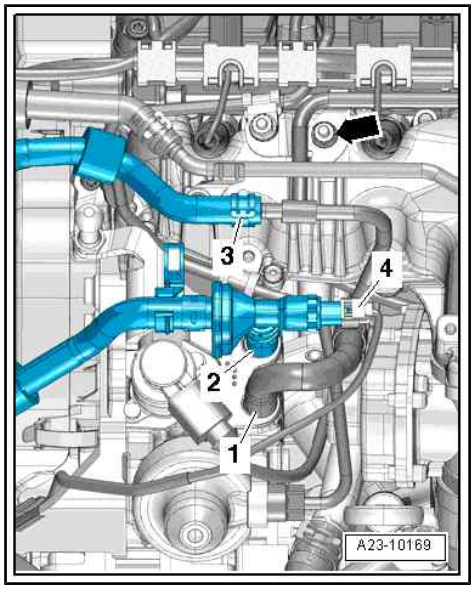
Note

The installation position can vary depending on version.

– On vehicles with engine code CBEA, detach pressure differential sender -3- from cylinder head cover.



– Unplug electrical connector -4- on fuel temperature sender - G81- .



WARNING

Very hot fuel - risk of burn injuries!

- *After switching off the engine, the temperature of fuel pipes and the fuel itself can be up to 100 °C in extreme cases. Let fuel cool off before opening any connections; otherwise there is a danger of scalding!*
- *Put on protective gloves.*
- *Put on safety goggles.*

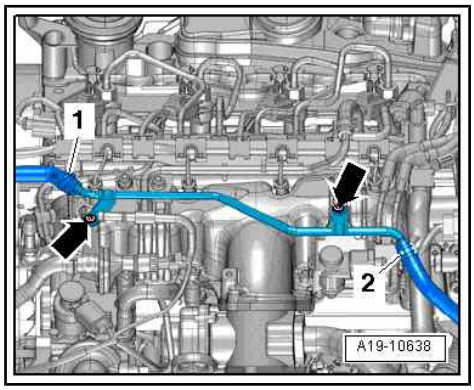
– Release hose clips -2- and -3- and disconnect fuel supply hose and fuel return hose.

– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

Note

Disregard -item 1- and -arrow-.

– Release hose clip -1- and detach coolant hose.

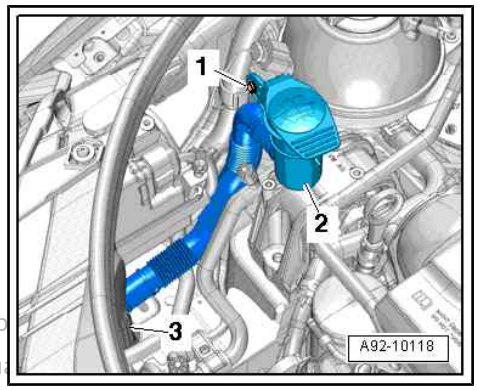


Note

-Item 2- and -arrows- can be disregarded.

– Remove bolt -1-.

– Push filler pipe with filler neck -2- for washer fluid reservoir to side.

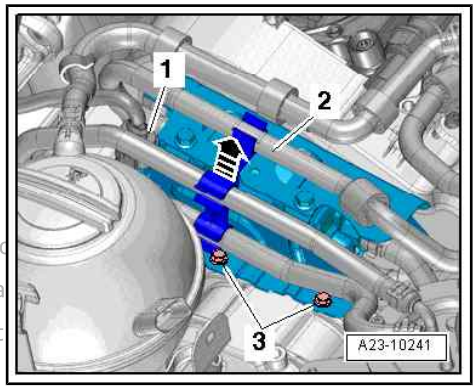


Note

- *Disregard -item 3-.*
- *For illustration purposes, the installation position is shown with the fuel filter removed.*

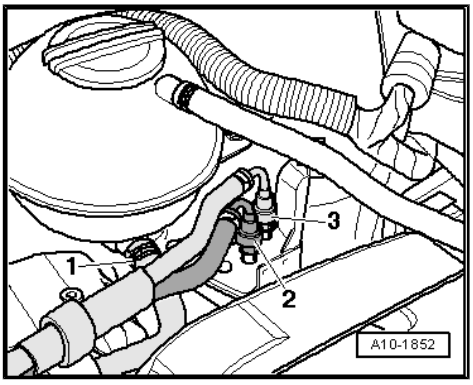
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– Disengage fuel hose -2- at bracket.
– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.
– Unplug electrical connector -1- at supplementary fuel pump - V393- .
– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.



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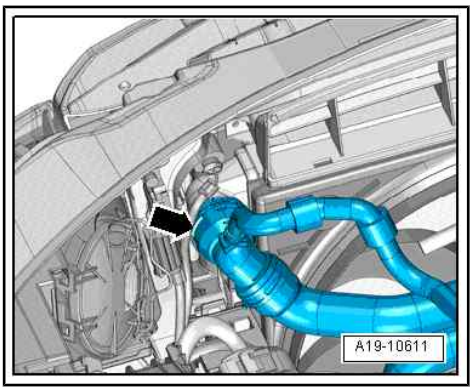
– Release hose clip -1-, detach coolant hose from coolant expansion tank and move coolant hose clear.



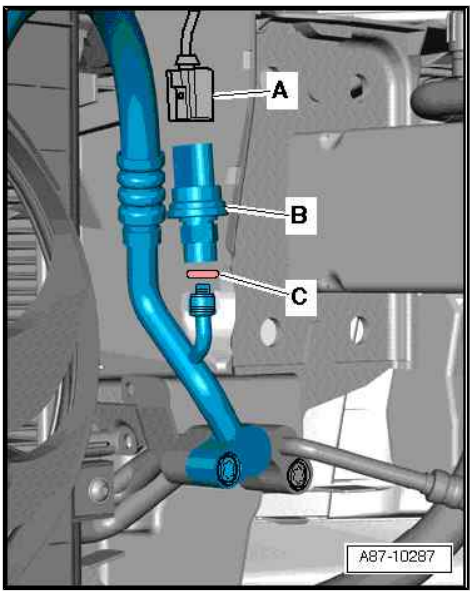
Note

Disregard items -2 and 3-.

– Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.



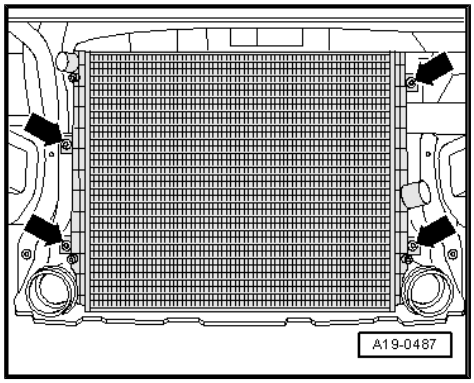
– Unplug electrical connector -A- at high-pressure sender - G65- -item B-.



Note

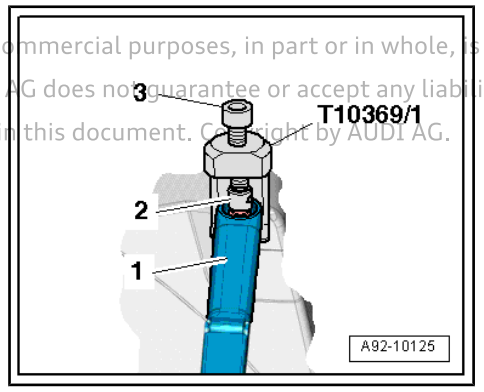
Disregard -item C-.

– Remove bolts -top arrows- at rear and lift out radiator.

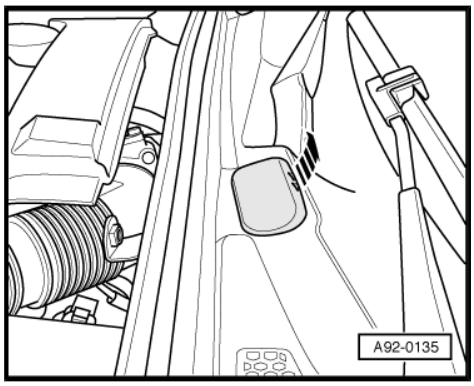


– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 .

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– Unclip washer jets -arrow-.
– Push washer jets through assembly opening back into plenum chamber, leaving hoses connected.

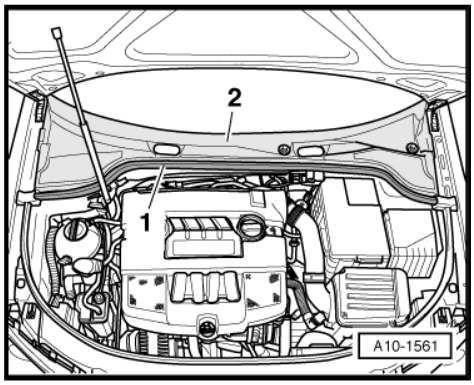


– Pull off seal -1-.

Caution

Risk of damage to plenum chamber cover.

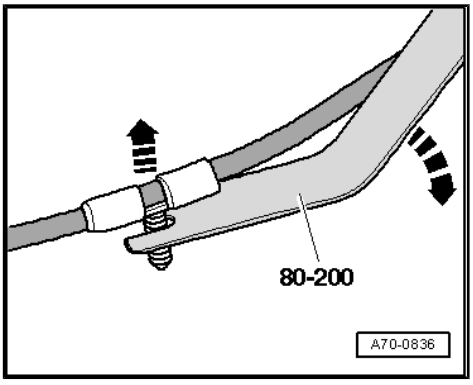
- ***Apply a small quantity of soap solution to transition between windscreen and plenum chamber cover -2-. Then, starting at edge of windscreen, carefully pull plenum chamber cover upwards off retainer at windscreen.***



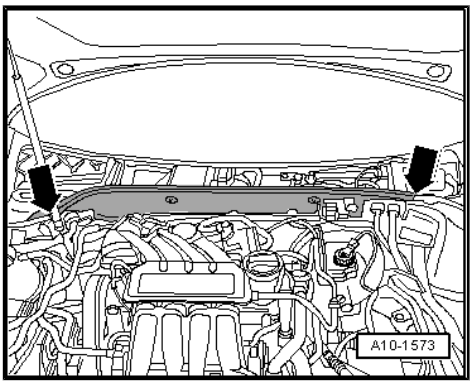
– Pull off plenum chamber cover.

Note

Use removal lever - 80 - 200- to lever out the wiring clips when performing the next work steps.



– Move clear engine wiring harness at rear of plenum chamber partition panel.
– Remove bolts -arrows- and detach plenum chamber partition panel.

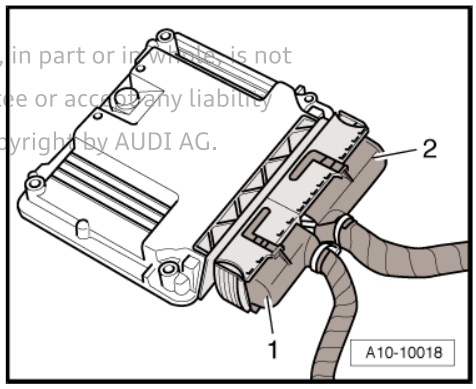


– Remove engine control unit ⇒ Rep. gr. 23 .
– Unplug electrical connector -1- for engine wiring harness.

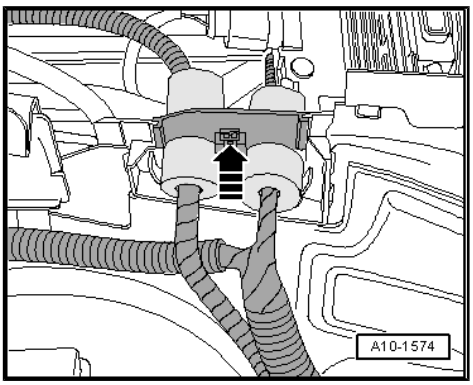
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Note

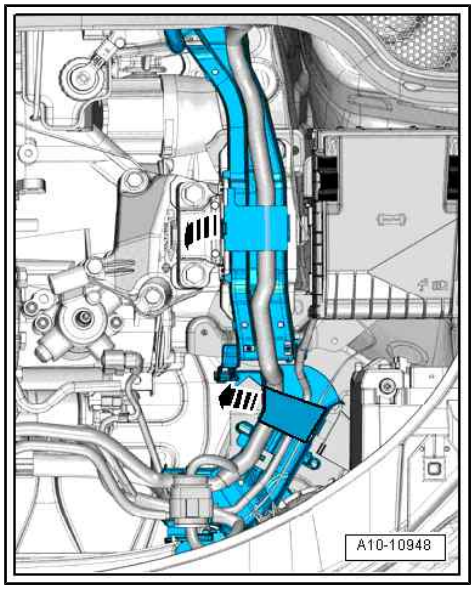
Disregard -item 2-.



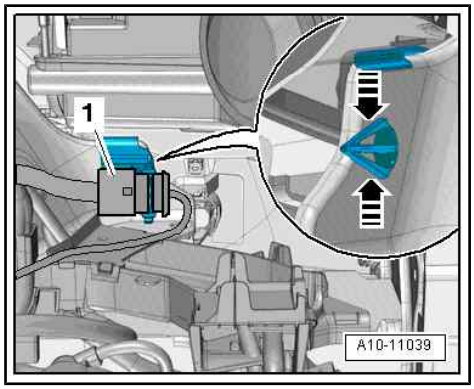
– Release wiring protector for engine wiring harness -arrow- and lift protector off.



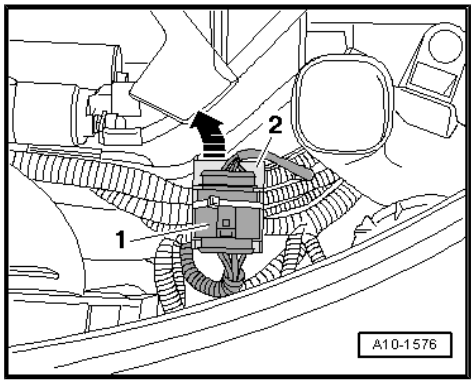
– Open retainers for wiring duct -arrows-.



– Detach electrical connector -1- with bracket; to do so, push wheel housing liner slightly to side and release retaining wedges on back -arrows-.
– Detach electrical connector from bracket and unplug.



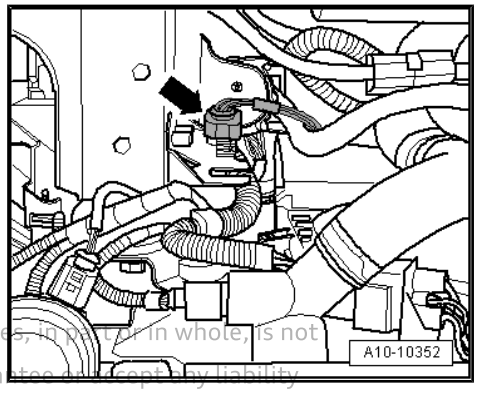
– Move clear and unplug electrical connector -1-.
– Open retainer for wiring duct -2-.
– Remove wiring harness for engine control unit from wiring duct and place on engine.



– Unplug electrical connector -arrow- at longitudinal member (bottom left).

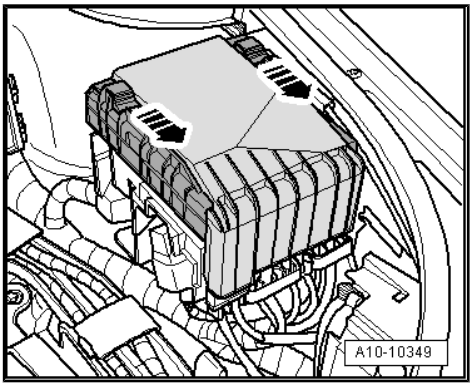
Note

For illustration purposes, the installation position is shown from below.

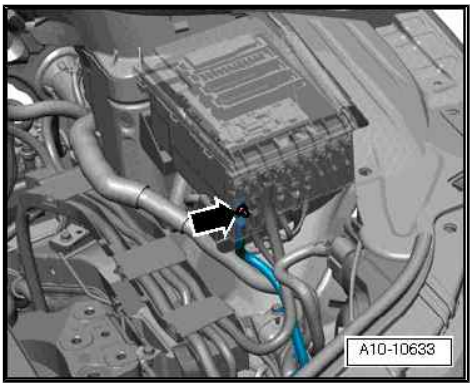


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– Slide the two clips in the direction of the -arrows- and remove cover from electronics box in engine compartment.



– Remove nut -arrow-, detach terminal 30 wire from electronics box in engine compartment and move it clear.

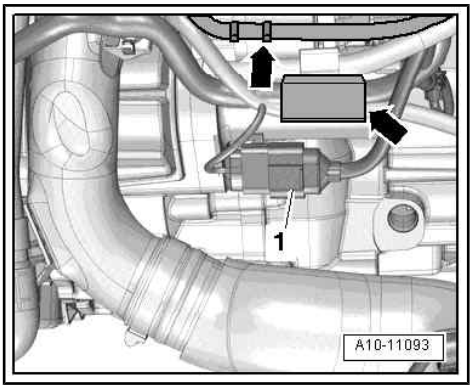


Vehicles with manual gearbox:

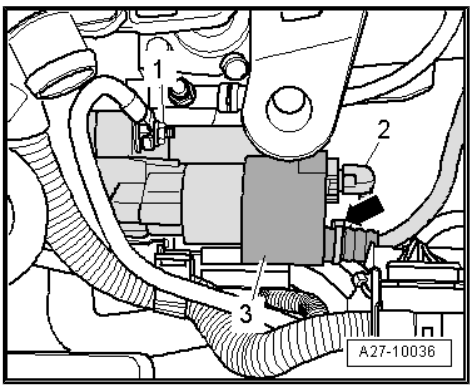
– Unplug electrical connector -1-.

Note

Disregard -arrows-.



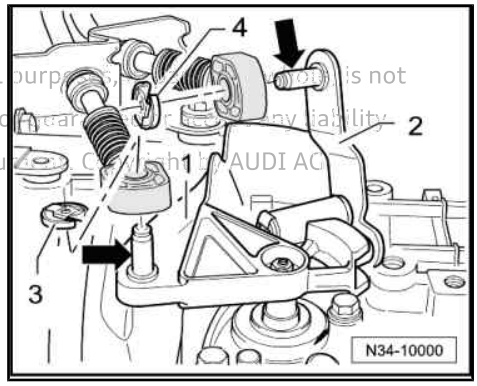
– Cut open cable tie -arrow- for protective cover -3-.
– Unplug electrical connector -2-.
– Push back protective cover and unscrew B+ cable at starter solenoid switch
– Remove nut -1- for earth wire.
– Remove top starter bolt.



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– Detach securing clip -3- for gear selector cable from gearbox selector lever -1- and pull cable off pin -arrow-.



Metal gate relay lever:

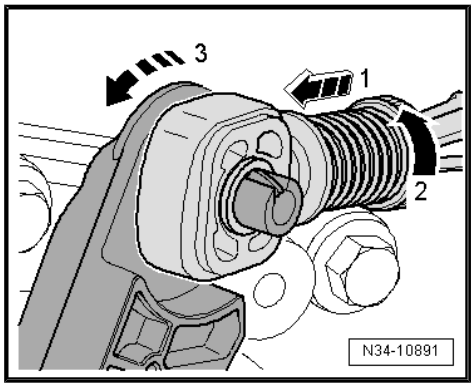
– Detach securing clip -4- for gate selector cable from gate relay lever -2- and pull cable off pin -arrow-.

Plastic gate relay lever:

- To prevent damage to gate selector cable, cable end-piece must be detached from gate selector cable before removing.

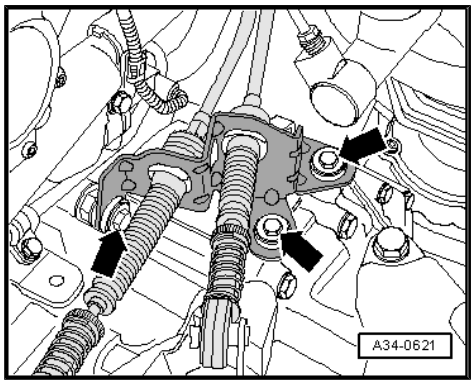
– Pull locking device forwards onto stop -arrow 1- and lock by turning anti-clockwise -arrow 2-.

– Press gate relay lever towards front -arrow 3-.

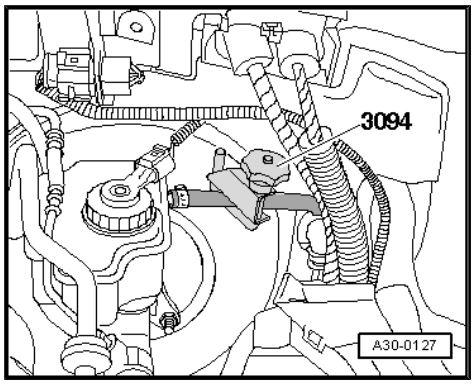


Vehicles with manual gearbox (continued):

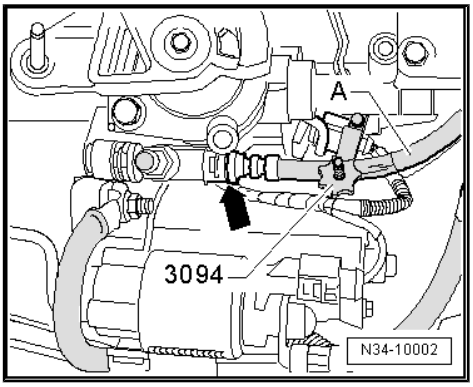
– Remove cable support bracket -arrows- from gearbox and place to one side (selector cables remain fitted).



– Vehicles with plastic pipe between clutch master cylinder and slave cylinder: clamp off supply hose at brake fluid reservoir using hose clamp -3094- .



– Vehicles with pipe/hose assembly between clutch master cylinder and slave cylinder: clamp off hose -A- at pipe/hose assembly using hose clamp - 3094- .

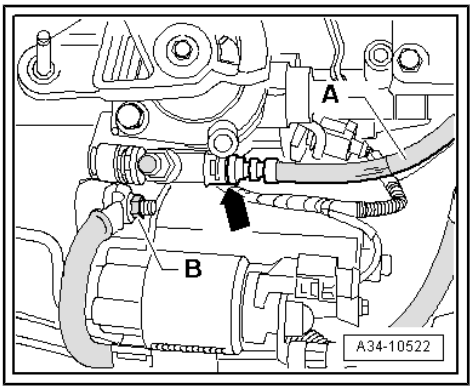


Note

Disregard -arrow-.

Note

Make sure brake fluid does not come into contact with starter or gearbox when performing the following operations. If it does, clean affected area thoroughly.



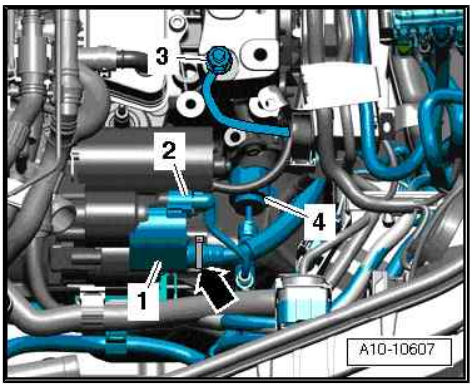
– Pull out clip -arrow- as far as stop.
– Pull plastic pipe or pipe/hose assembly -A- out of bleeder connection for clutch slave cylinder.

Note

Disregard -item B-.

– Seal off open pipes/lines and connections with clean plugs from engine bung set - VAS 6122- .

Vehicles with dual clutch gearbox:



– Cut open cable tie -arrow- for protective cover -1-.
– Unplug electrical connector -2-.
– Push back protective cover and unscrew B+ cable at starter solenoid switch
– Remove nut -3- and detach earth wire.

Caution

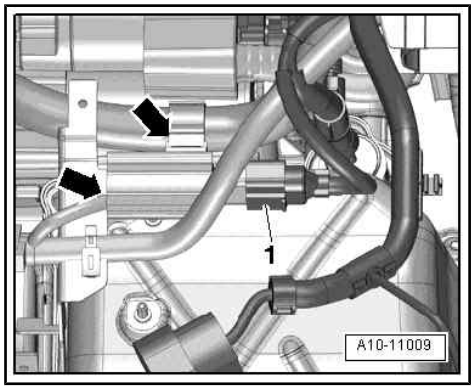
Risk of damage to control unit (mechatronic unit) by static discharge.

- ***Do NOT touch connector contacts in gearbox connector with your hands.***

– Touch vehicle earth with bare hands to eliminate any static charge.
– Turn retainer catch anti-clockwise and unplug electrical connector -4- at gearbox.

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– Unplug electrical connector -1-.

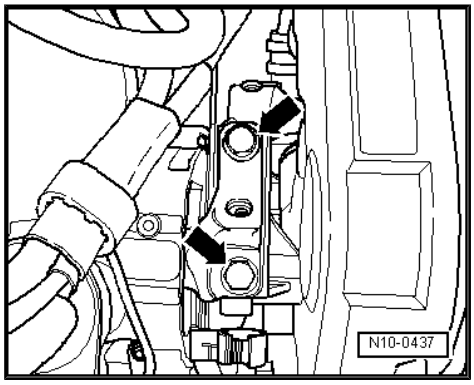


Note

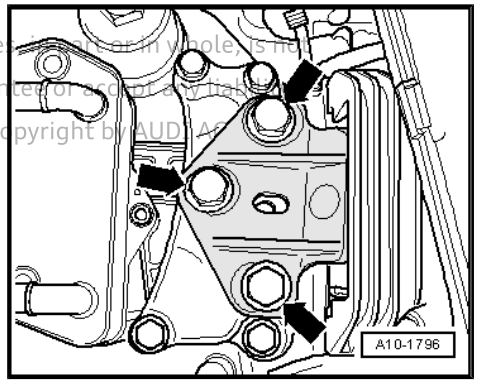
Disregard -arrows-.

All vehicles (continued):

– Loosen bolts -arrows- for assembly mounting (engine end) approx. 2 turns.



– Loosen bolts -arrows- for assembly mounting (gearbox end) approx. 2 turns.



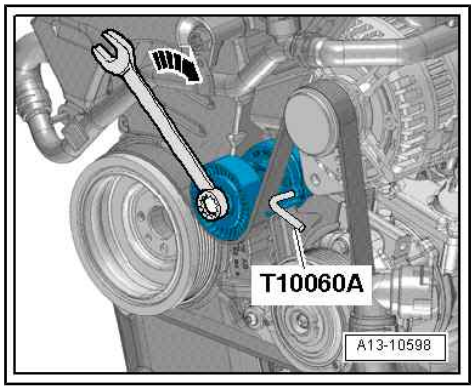
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Vehicles with air conditioner compressor and tensioner:

Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- ***Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.***



– Move tensioner in clockwise direction -arrow- to slacken poly V-belt.

– Lock tensioner with locking pin - T10060 A- .

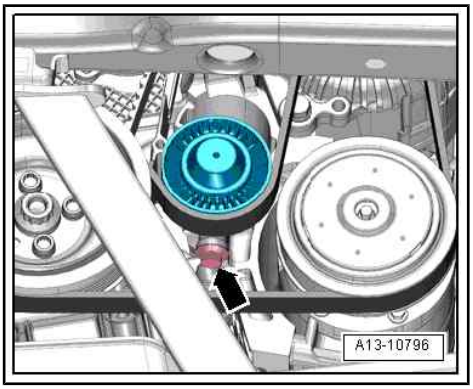
– Take off poly V-belt.

Vehicles with air conditioner compressor and tensioning roller:

Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*



– Remove bolt -arrow- and detach tensioner to slacken poly V-belt.

– Take off poly V-belt.

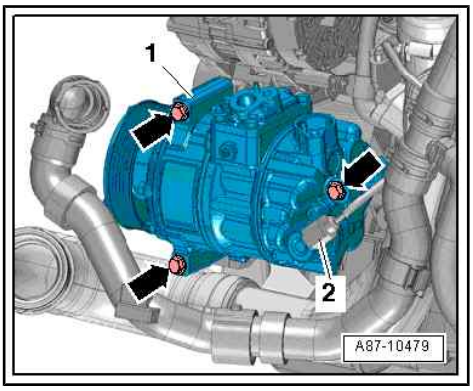
All vehicles with air conditioner compressor (continued):

– Unplug electrical connector -2- on air conditioner compressor regulating valve - N280- .

Caution

Risk of damage to air conditioner compressor and refrigerant pipes/hoses.

- *Do NOT stretch, kink or bend refrigerant lines and hoses.*

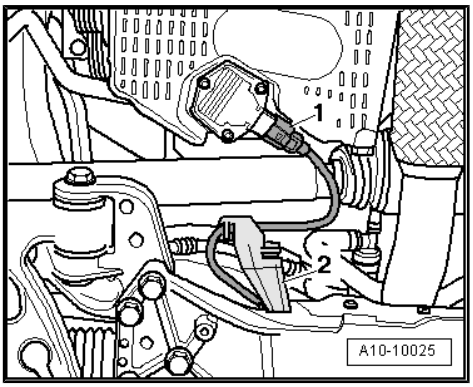


– Remove bolts -arrow-, detach air conditioner compressor -1- with refrigerant lines connected and tie up to front.

All vehicles (continued):

– Unplug electrical connector -1- at oil level and oil temperature sender - G266- .

– Unclip bracket -2- for electrical wire leading to oil level and oil temperature sender - G266- from subframe.

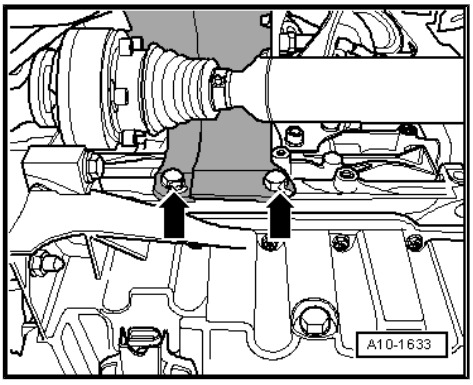


Vehicles with front-wheel drive:

– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).

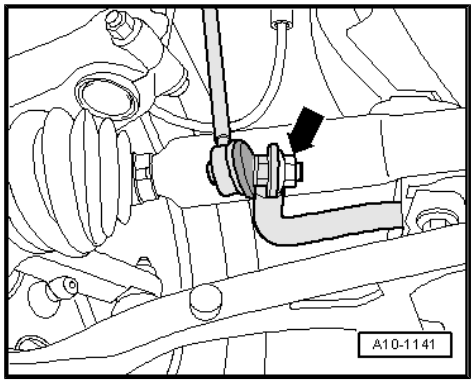
– Unbolt drive shafts (left and right) from gearbox flange shaft.

– Tie up drive shaft (left-side).



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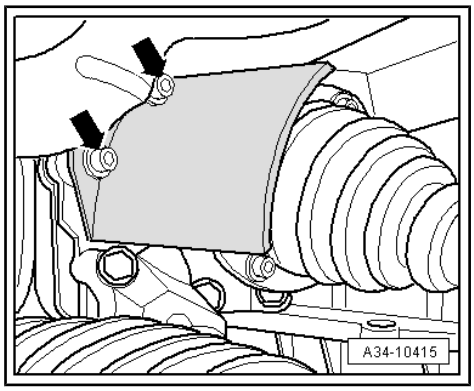
– Remove nuts -arrow- for coupling rod on anti-roll bar on both sides.



Vehicles with four-wheel drive:

– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).

– Detach drive shaft (left-side) from flange shaft of gearbox and tie up.



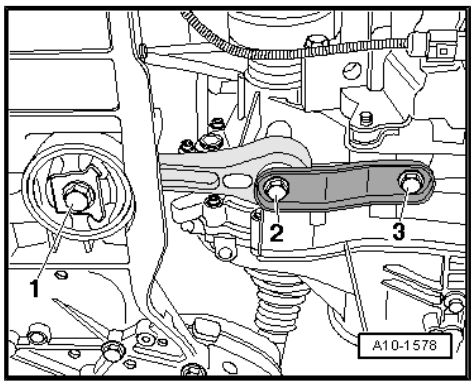
Note

Take care not to damage the surface coating of the drive shaft.

– Detach drive shaft (right-side) from flange shaft of bevel box.

All vehicles (continued):

– Unscrew bolts -1 ... 3- and remove pendulum support.



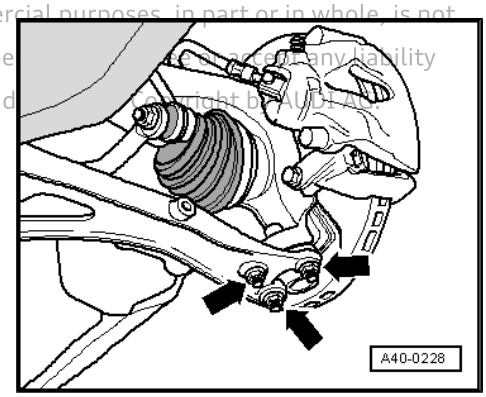
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– Mark position of nuts -arrows- securing swivel joint.

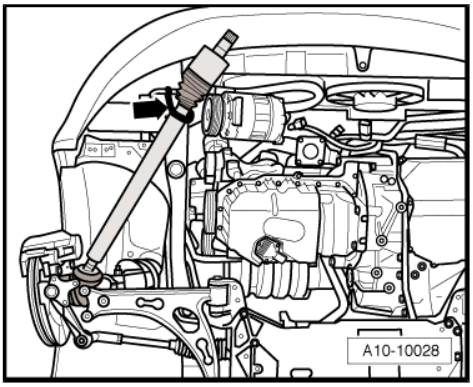
– Remove nuts for swivel joint (right-side).

– If fitted, unscrew nut on bracket for front left vehicle level sender - G78- .

– Detach swivel joint from wishbone.



Vehicles with front-wheel drive:



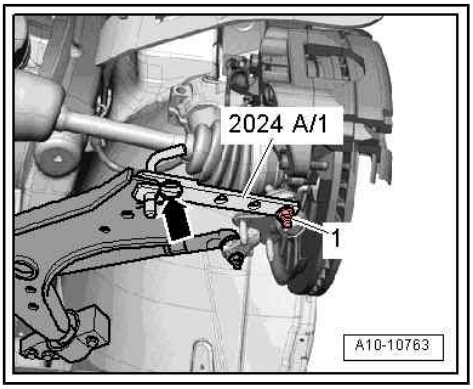
– Pivot drive shaft (right-side) forwards; to do so, push engine/ gearbox assembly slightly forwards.

– Tie up drive shaft to longitudinal member -arrow-.

Note

Take care not to damage the surface coating of the drive shaft.

Vehicles with four-wheel drive:



– Swing suspension strut (right-side) outwards and support with extension -2024 A /1- as shown in illustration.

WARNING

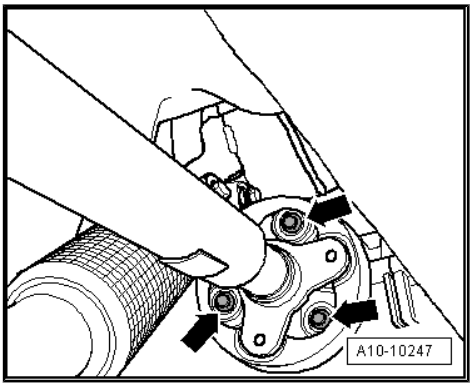
Accident risk from loose components of support bracket.

- ***Secure retaining pin and swivel joint with locking pin -arrow- and nut -1-.***

Note

The illustration shows the installation position on front suspension (left-side).

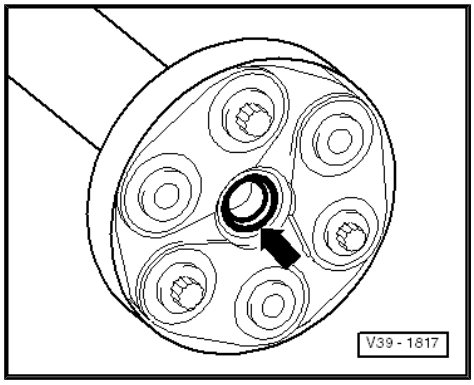
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– Mark position of flexible coupling and flange for bevel box in relation to each other.

– Unbolt flexible coupling for propshaft at bevel box -arrows- (counterhold using a suitable lever at the triangular flange).

– Push engine/gearbox assembly forward slightly (towards front end) and pull propshaft off bevel box.



Caution

Make sure not to damage the oil seal -arrow- in the propshaft flange.

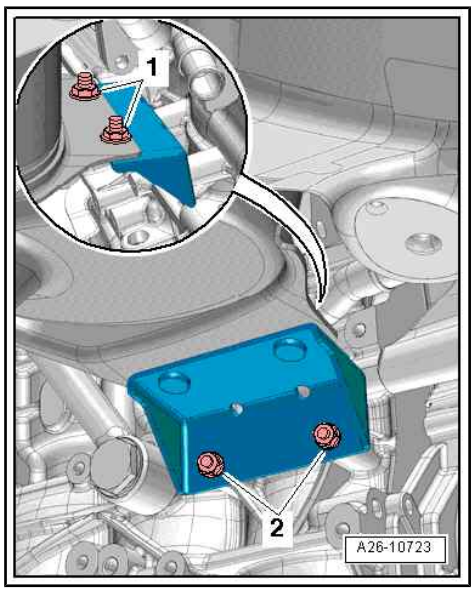
- ***Push the propshaft horizontally to the rear and towards the right side of the vehicle as far as possible.***

Note

The propshaft must be renewed if the oil seal is damaged.

All vehicles (continued):

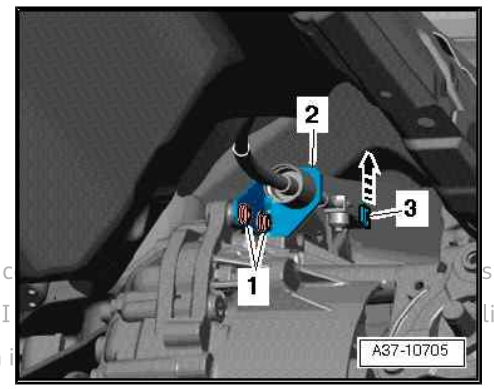
– Remove nuts -1- and -2- and detach bracket for particulate filter.



Vehicles with dual clutch gearbox:

– Remove bolts -1- for cable support bracket.

– Pull off securing clip -3- -arrow- and remove selector lever cable from gearbox.



Note

Disregard -item 2-.

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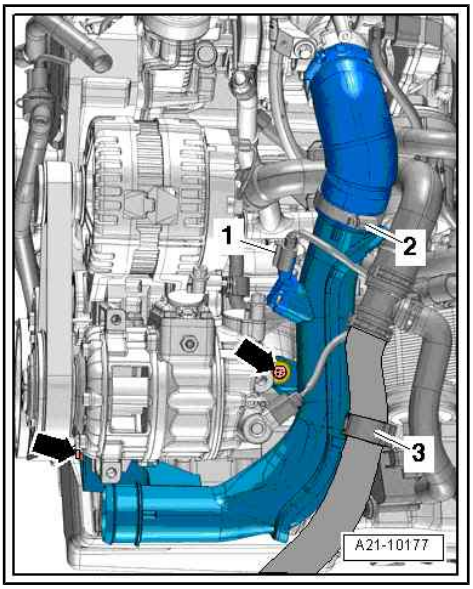
All vehicles (continued):

– Remove bolts -arrows-.

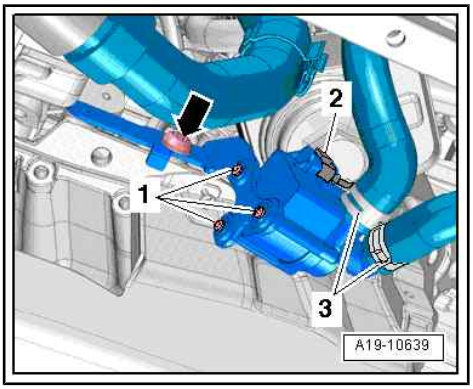
– Move coolant hose -3- clear.

– Release hose clip -2-.

– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe.



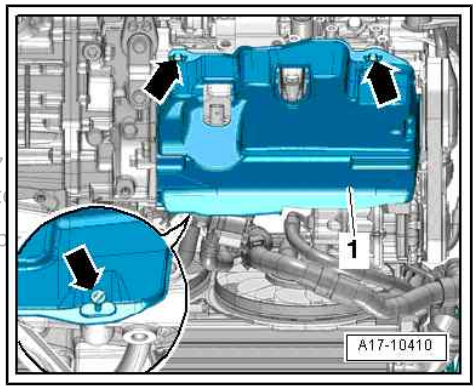
– Remove bolt -arrow- and push pump for exhaust gas recirculation cooler - V400- to the side.



Note

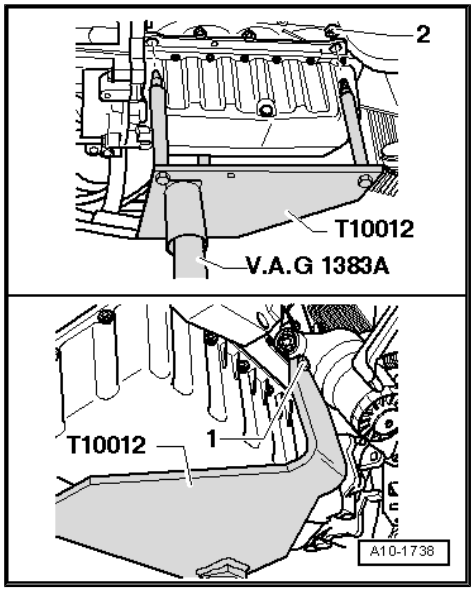
Disregard -items 1, 2, 3-.

– Release fasteners -arrows- and remove noise insulation -1- for sump.



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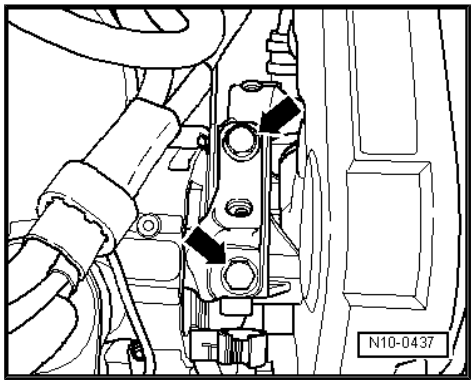
– Secure engine bracket - T10012- to cylinder block with bolt -1- and nut -2- (tightening torque: approx. 20 Nm).
– Insert engine and gearbox jack - V.A.G 1383 A- in engine bracket - T10012- and raise engine/gearbox assembly slightly.



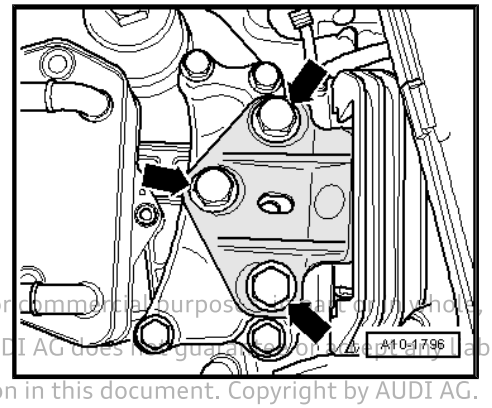
Note

To unscrew bolts for assembly mounting use stepladder - VAS 5085- .

– Remove bolts -arrows- for assembly mounting (engine end).



– Remove bolts -arrows- for assembly mounting (gearbox end).



Note

- *Check that all hoses, pipes and wiring connections between engine, gearbox and body have been detached.*
- *Carefully guide engine/gearbox assembly when lowering to avoid damage.*
- *Make sure there is sufficient clearance at air conditioner compressor and at left-side drive shaft.*

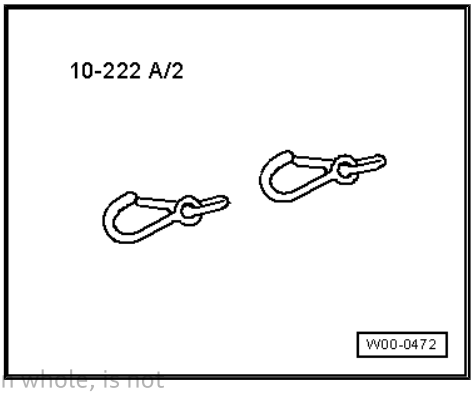
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– First lower engine/gearbox assembly only slightly.
– Then swing gearbox end of engine/gearbox assembly forwards and only then lower further.

2 Separating engine and manual gearbox

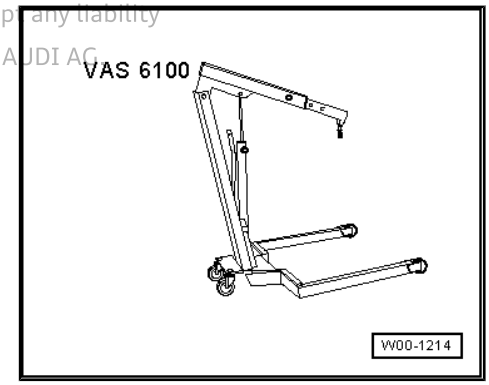
Special tools and workshop equipment required

- Hooks - 10 - 222 A /2-

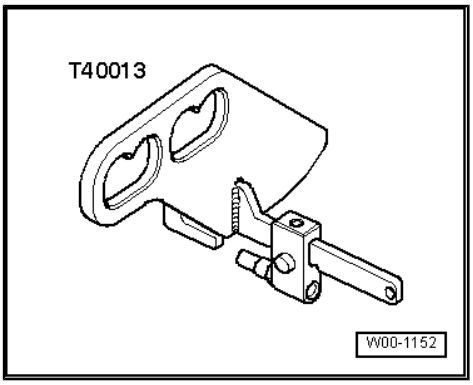


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- Workshop hoist - VAS 6100-



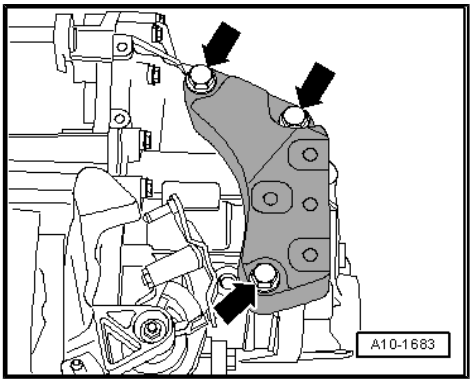
- Lifting tackle - T40013-



Procedure

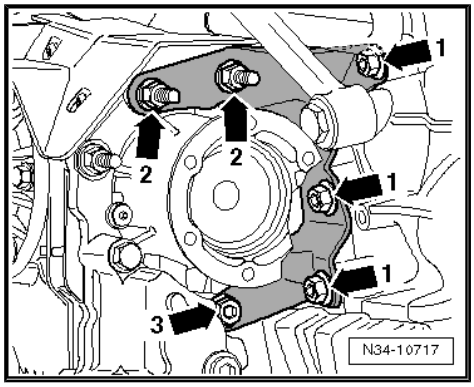
- Engine/gearbox assembly removed and attached to engine bracket - T10012- .

– Unscrew bolts -arrows- and detach gearbox support.



Vehicles with four-wheel drive:

– Remove bolts -arrows 2, 3- securing bracket for bevel box.



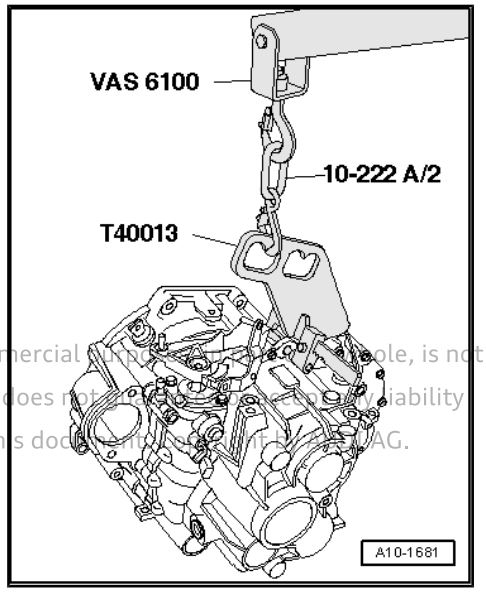
Note

Disregard -arrows 1-.

All vehicles (continued):

– Attach lifting tackle - T40013- to gearbox and close lock.

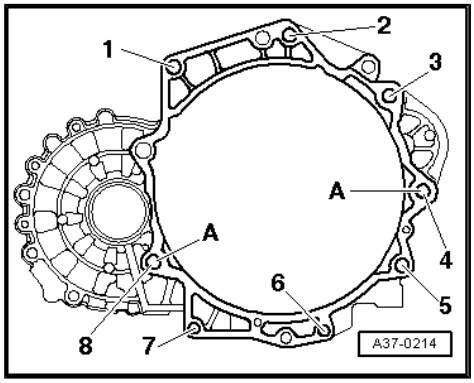
– Attach workshop hoist - VAS 6100- with hooks - 10 - 222 A / 2- to the lifting tackle.



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– Remove bolts -1, 2, 5, 6, 7, 8- securing gearbox to engine.

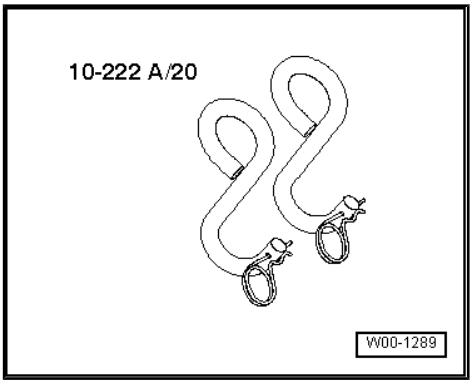
– Detach gearbox from engine.



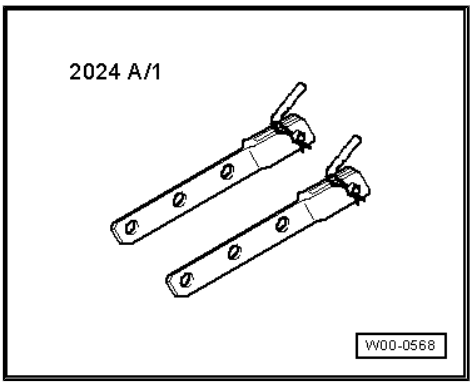
3 Separating engine and dual clutch gearbox

Special tools and workshop equipment required

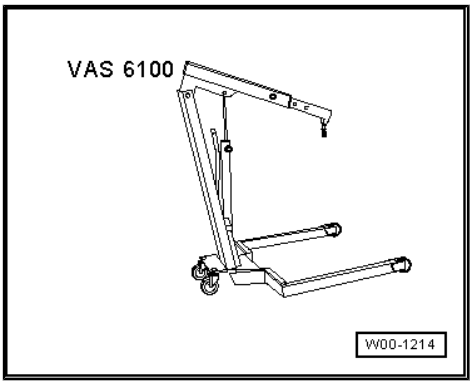
- Adapters - 10 - 222 A /20-



- Hook -2024 A /1- of lifting tackle - 2024 A-



- Workshop hoist - VAS 6100-

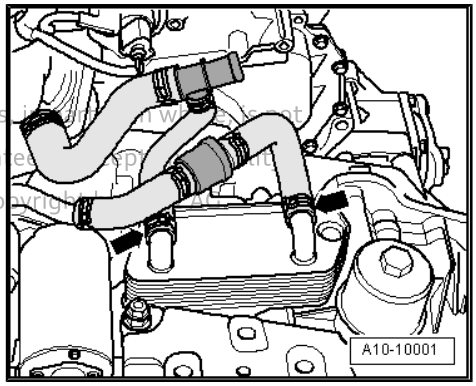


Procedure

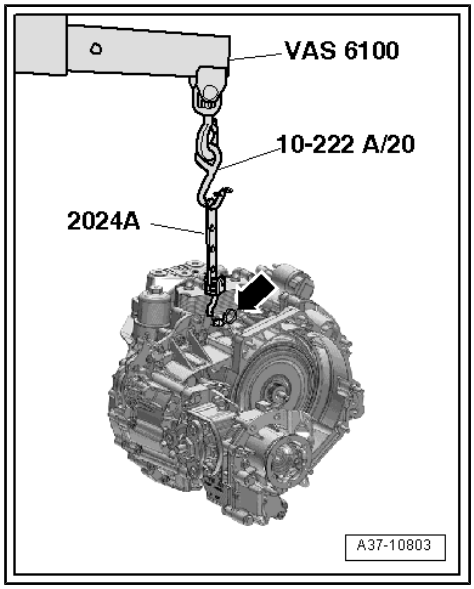
- Engine/gearbox assembly removed and attached to engine bracket - T10012- .

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– Slacken hose clips -arrows- and detach coolant hoses from gear oil cooler.

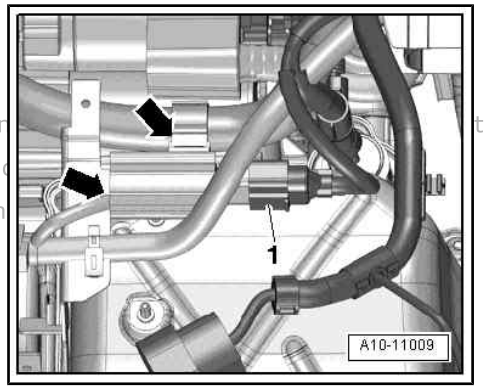


– Engage hook of lifting tackle - 2024 A- in gearbox lifting eye and secure with locking pin -arrow-.
– Engage workshop hoist - VAS 6100- with adapter - 10 - 222 A /20- in lifting tackle.

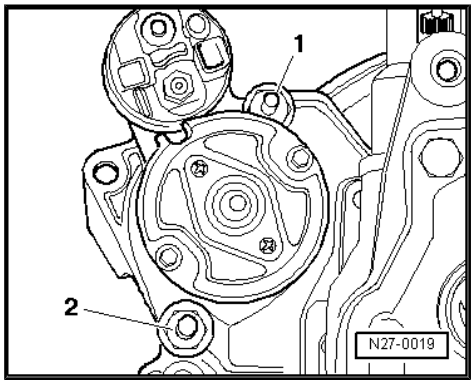


– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.

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– Unscrew bolts -1- and -2- and remove starter from gearbox.

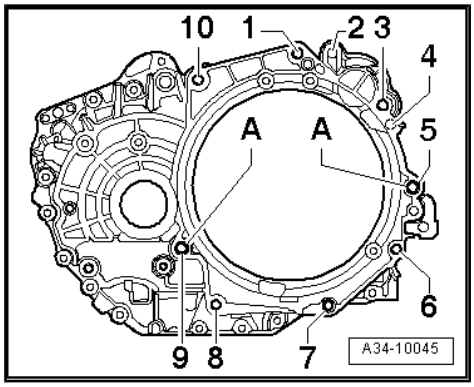


– Remove remaining bolts -1, 3, 5, 6, 7, 8, 9, 10- securing gearbox to engine.

Note

- *Bolt -3- can be accessed only after removing starter.*
- *Disregard -items 2 and 4- and -A-.*

– Detach gearbox from engine.

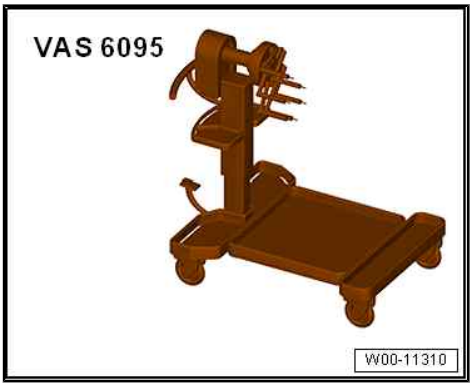


4 Securing engine to engine and gearbox support

When carrying out repairs, secure engine to engine and gearbox support - VAS 6095A- using universal support - VAS 6095/1- .

Special tools and workshop equipment required

- Engine and gearbox support - VAS 6095A-

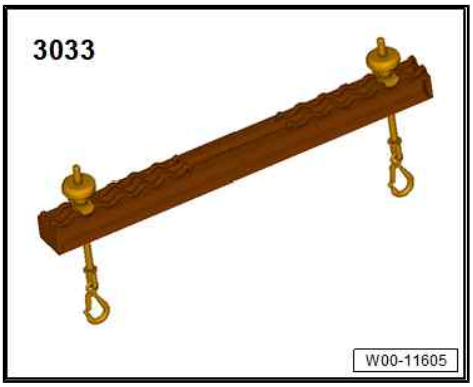


- Workshop hoist - VAS 6100-



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- Lifting tackle - 3033-

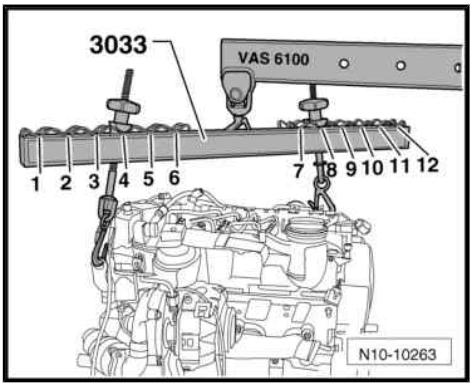


Procedure

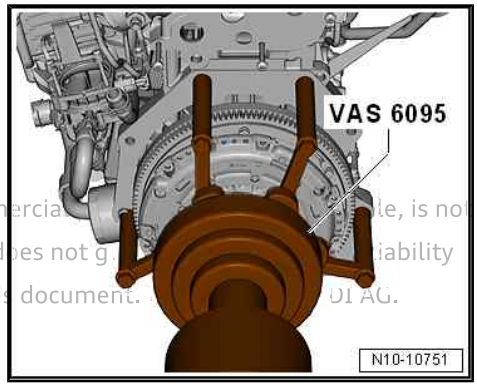
- Gearbox detached from engine.

– Attach lifting tackle - 3033- to engine and workshop hoist - VAS 6100- as shown in illustration.

– Lift engine off engine bracket - T10012- using workshop hoist - VAS 6100- .



– Secure engine to engine and gearbox support - VAS 6095A- using universal support - VAS 6095/1- .



Tightening torque

Component		Nm
Bolts/nuts	M6	10
	M8	20
	M10	45
	M12	65

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5 Installing engine

Tightening torques

Note

- *Tightening torques apply only to lightly greased, oiled, phosphated or black-finished nuts and bolts.*
- *Additional lubricants such as engine or gear oil may be used, but do not use lubricants containing graphite.*
- *Do not use degreased parts.*
- *Tolerance for tightening torques: ± 15 %*

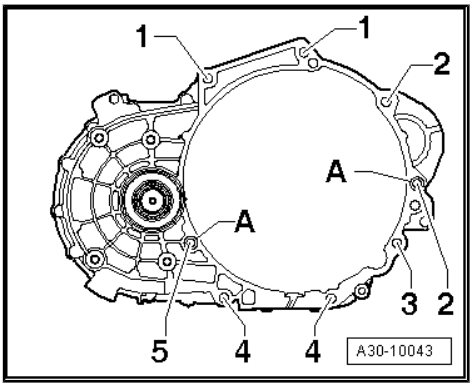
Component		Nm
Bolts/nuts	M6	10
	M7	15
	M8	20
	M10	40
	M12	65
Except for the following:		
Underbody cross member (front) to body		23

Assembly mountings
⇒ "6.1 Exploded view - assembly mountings", page 44

Securing manual gearbox to engine

Item	Bolt	Nm
1[1)]	M12x55	80
2[1)]	M12x165	80
3	M10x105	40
4	M10x50	40
5[2)]	M12x65	80
A	Dowel sleeves for centralising	

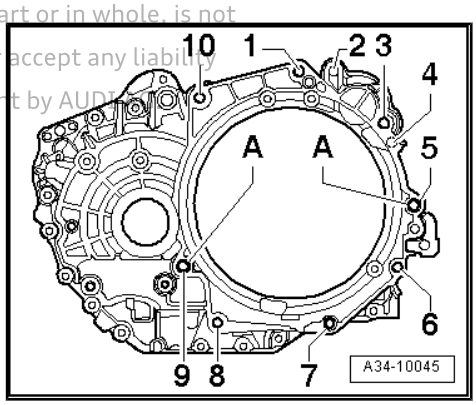
- [1)] Bolt with M8 threaded pin
- [2)] Screwed into gearbox from engine side



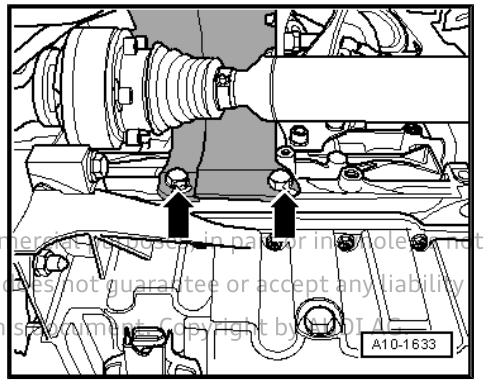
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Securing dual-clutch gearbox to engine

Item	Bolt	Nm
1, 3, 10	M12x55	80
5	M12x65	80
6, 7, 8	M10x50	40
9	M12x70	80
2, 4	Securing starter ⇒ Electrical system; Rep. gr. 27	
A	Dowel sleeves for centralising	



Heat shield for drive shaft (right-side) - tightening torque



Note

Illustration shows heat shield on vehicles with front-wheel drive as an example.

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– Tighten bolts -arrows- to 35 Nm.

Procedure

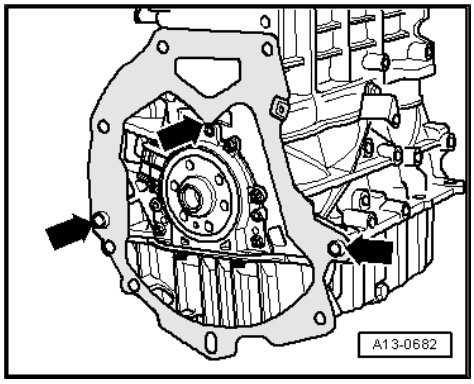
Installation is carried out in reverse order; note the following:

- Engine/gearbox assembly attached to engine bracket - T10012- .

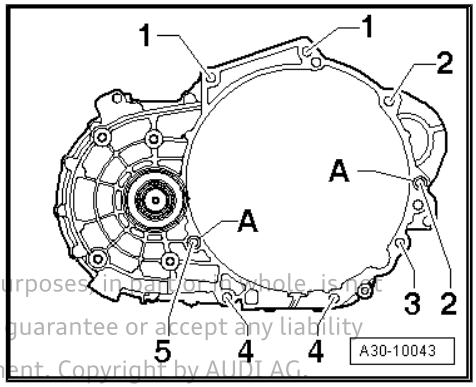
Note

- *Vehicles with dual clutch gearbox: The needle bearing in the crankshaft must always be renewed if the engine has been separated from the gearbox*
  ⇒ "3.5 Extracting and driving in needle bearing for crankshaft", page 88 .
- *Renew bolts tightened with specified tightening angle.*
- *Renew self-locking nuts and bolts as well as seals, gaskets and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*
- *Fit all cable ties in the original positions when installing.*

– Ensure that intermediate plate is engaged on sealing flange and pushed onto dowel sleeves -arrows-.



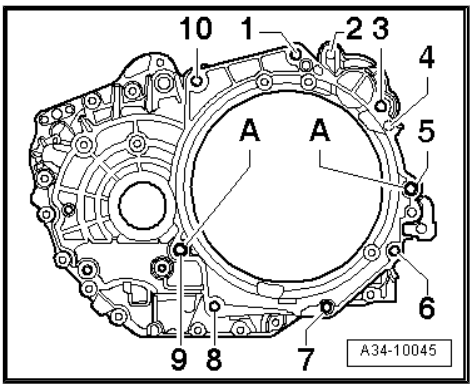
Vehicles with manual gearbox:



- If not already fitted, install dowel sleeves -A- for centring engine and gearbox in cylinder block.
- Remove needle bearing in crankshaft if fitted ⇒ page 88 .
- Renew clutch release bearing if worn ⇒ Rep. gr. 30 .
- Lubricate splines of gearbox input shaft lightly with grease for clutch plate splines ⇒ Electronic parts catalogue .
- Make sure that clutch plate is properly centred.

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Vehicles with dual clutch gearbox:



- If not already fitted, install dowel sleeves -A- for centring engine and gearbox in cylinder block.
- Install needle bearing if not fitted in crankshaft ⇒ “3.5 Extracting and driving in needle bearing for crankshaft”, page 88 .

All vehicles (continued):

- Secure gearbox to engine.

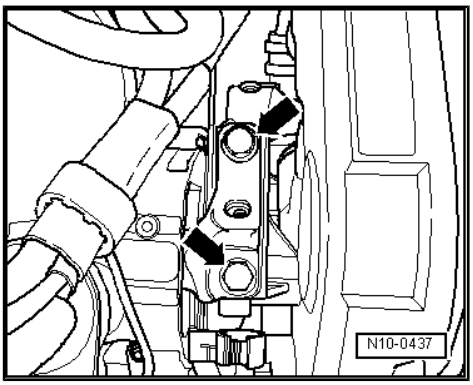
Vehicles with four-wheel drive:

- Install bracket for bevel box ⇒ Rep. gr. 34 .

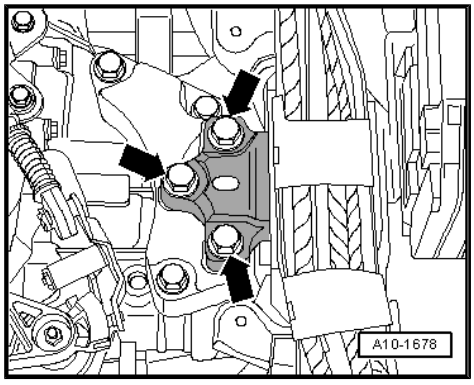
All vehicles (continued):

- Guide engine/gearbox assembly into body.
- Initially hand-tighten bolts -arrows- for assembly mounting (engine end) as far as stop.

.



– Initially hand-tighten bolts -arrows- for assembly mounting (gearbox end) as far as stop.



Note

The bolts are tightened to final torque only after adjusting the assembly mountings ⇒ page 47 .

– Remove engine bracket - T10012- from engine.
– Install starter ⇒ Electrical system; Rep. gr. 27 .
– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 211 .
– Install air pipe ⇒ page 268 .

Vehicles with dual clutch gearbox:

– Install and adjust selector lever cable ⇒ Rep. gr. 34 .

All vehicles (continued):

– Install particulate filter ⇒ page 279 .

Vehicles with four-wheel drive:

– Bolt flexible coupling on propshaft to bevel box flange ⇒ Rear final drive 02D, 0AV, 0BR and 0BY; Rep. gr. 39 .

All vehicles (continued):

– Install drive shafts, wishbones and coupling rod ⇒ Rep. gr. 40 .
– Install heat shield for drive shaft (right-side) ⇒ page 40 .
– Install air conditioner compressor ⇒ Rep. gr. 87 .
– Install poly V-belt:

◆ ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 57

◆ ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 63

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– Install front sections of wheel housing liner ⇒ Rep. gr. 66 .
– Fit front wheels ⇒ Wheels and tyres; Rep. gr. 44 .
– Install engine control unit ⇒ Rep. gr. 23 .
– Install radiator ⇒ page 232 .
– Connect coolant hoses with plug-in connectors to heat exchanger for heater ⇒ page 232 .
– Install supplementary fuel pump - V393- ⇒ Rep. gr. 20 .
– Install exhaust gas pressure sensor 1 - G450- ⇒ Rep. gr. 23 .
– Install filler pipe with filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .
– Install air hose with plug-in connector ⇒ page 270 .
– Adjust assembly mountings ⇒ page 47 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .

– Install and adjust wiper arms ⇒ Electrical system; Rep. gr. 92 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Check oil level ⇒ Maintenance ; Booklet 808 .

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Caution

Risk of irreparable damage to control units because of excessive voltage.

- ***Never use battery charging equipment for boost starting.***

– Fill up with coolant ⇒ page 200 .

Note

- *Drained-off coolant may only be used again if the original cylinder head and cylinder block are re-installed.*
- *Contaminated or dirty coolant must not be used again.*

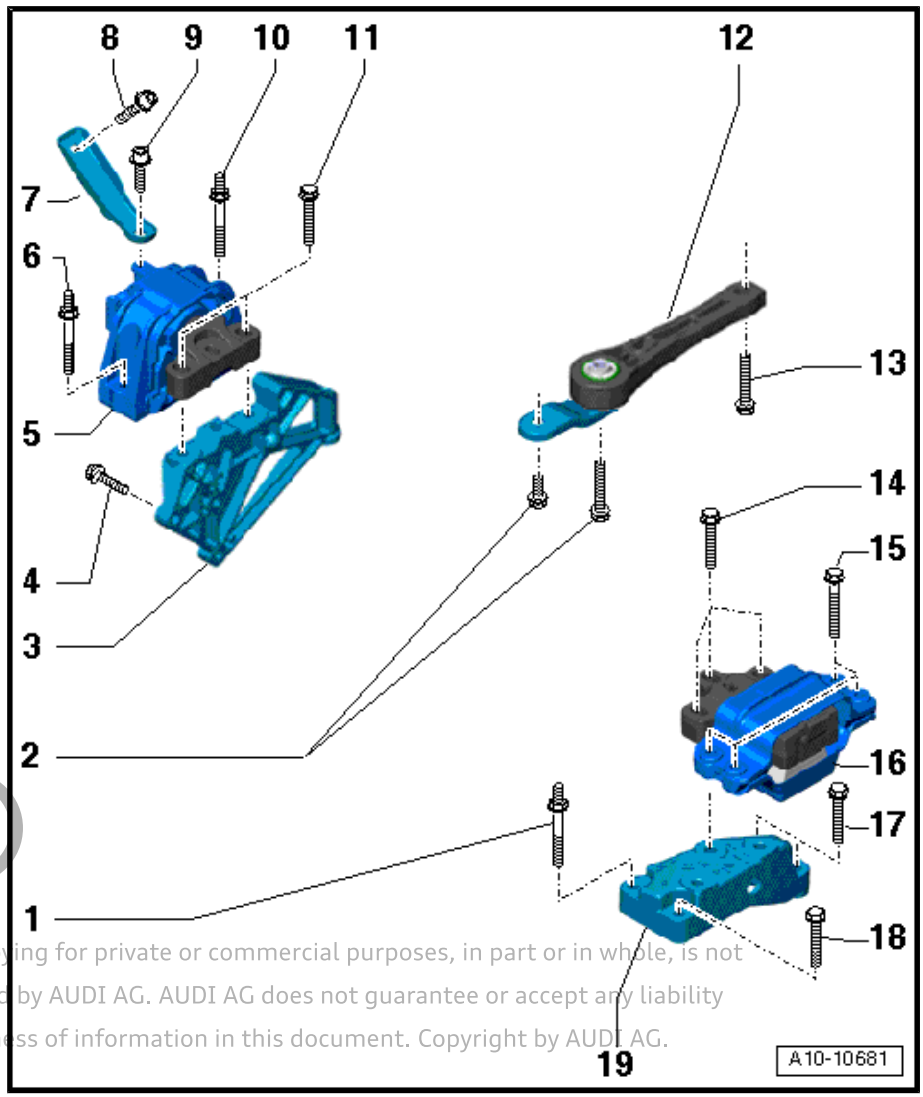
– Install noise insulation frame (if fitted) and noise insulation panels ⇒ Rep. gr. 50 .

6 Assembly mountings

Overview

- ⇒ “6.1 Exploded view - assembly mountings”, page 44
- ⇒ “6.2 Checking adjustment of assembly mountings (engine/ gearbox mountings)”, page 46
- ⇒ “6.3 Adjusting assembly mountings”, page 47

6.1 Exploded view - assembly mountings



1 - Bolt
- ❑ Gearbox support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

2 - Bolts
- ❑ Pendulum support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

3 - Engine support
- ❑ Version fitted in vehicle may differ from illustration

4 - Bolt
- ❑ Engine support to engine
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 45

5 - Engine mounting
- ❑ With support arm

6 - Bolt
- ❑ Engine mounting to body
- ❑ Renew
- ❑ 40 Nm +90°

7 - Connecting bracket

8 - Bolt
- ❑ Connecting bracket to engine mounting
- ❑ Renew
- ❑ 20 Nm +90°

9 - Bolt
- ❑ Connecting bracket to body
- ❑ Renew
- ❑ 20 Nm +90°

10 - Bolt
- ❑ Engine mounting to body
- ❑ Renew

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- ❑ 40 Nm +90°

11 - Bolts

- ❑ Engine mounting to engine support
- ❑ Renew
- ❑ 60 Nm +90°

12 - Pendulum support

13 - Bolt

- ❑ Pendulum support to subframe
- ❑ Tightening torque ⇒ Rep. gr. 34

14 - Bolt

- ❑ Gearbox mounting to gearbox support
- ❑ Tightening torque ⇒ Rep. gr. 34

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15 - Bolt

- ❑ Gearbox mounting to body
- ❑ Tightening torque ⇒ Rep. gr. 34

16 - Gearbox mounting

- ❑ With support arm

17 - Bolt

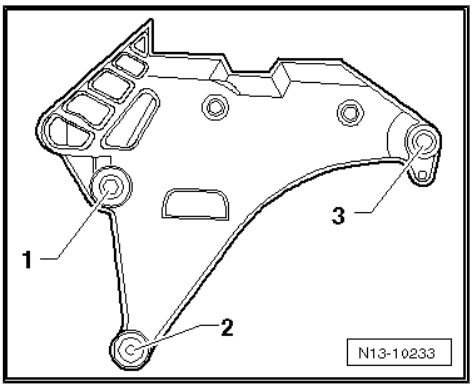
- ❑ Gearbox support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

18 - Bolt

- ❑ Gearbox support to gearbox
- ❑ Tightening torque ⇒ Rep. gr. 34

19 - Gearbox support

Engine support - tightening torque and sequence



Note

Renew bolts tightened with specified tightening angle.

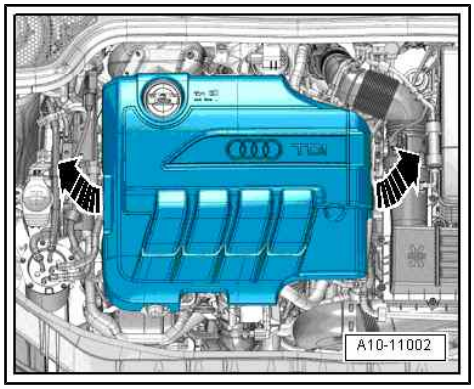
– Tighten bolts in 3 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 3-	7 Nm
2.	-1 … 3-	40 Nm
3.	-1 … 3-	Turn 180° further

6.2 Checking adjustment of assembly mountings (engine/gearbox mountings)

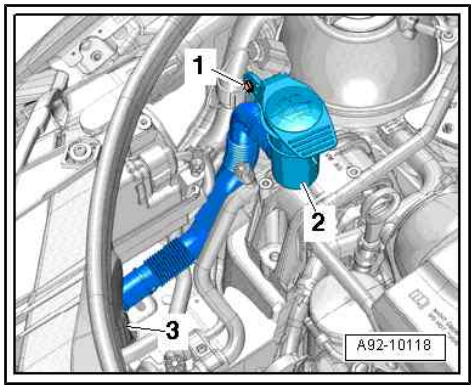
Procedure

– Remove engine cover panel -arrows-.



– Remove bolt -1-.

– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



Note

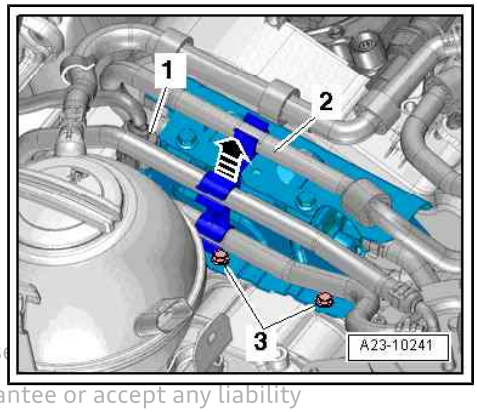
- *Disregard -item 3-.*
- *For illustration purposes, the installation position is shown with the fuel filter removed.*

– Disengage fuel hose -2- at bracket.

– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.

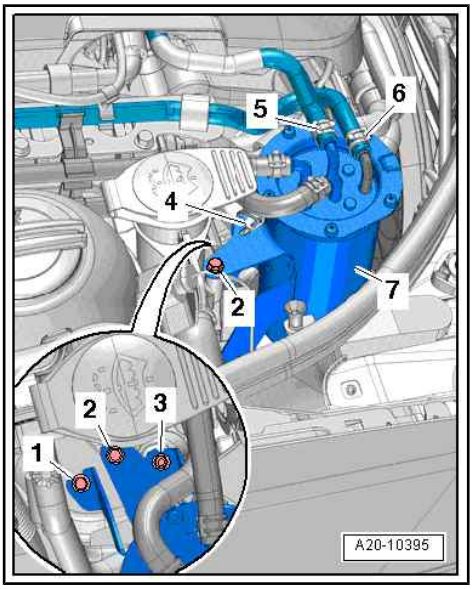
– Unplug electrical connector -1- at supplementary fuel pump - V393- .

– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.



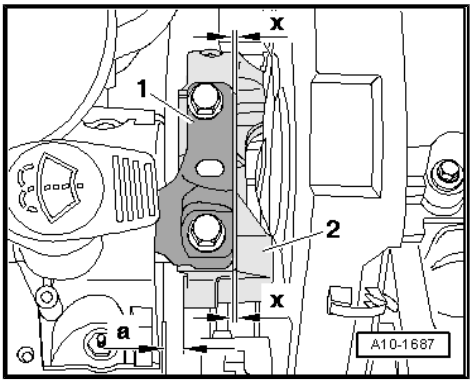
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– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach hose retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



The following specifications must be obtained:

- There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
- The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- = distance -x-).



Note

Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

– If the distance measured is too large or small, the assembly mountings must be adjusted ⇒ page 47 .

Assembling

Installation is carried out in the reverse order; note the following:

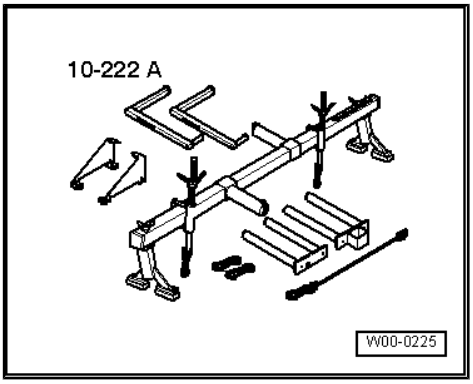
– Install supplementary fuel pump - V393- and fuel filter ⇒ Rep. gr. 20 .
– Install filler pipe with filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .

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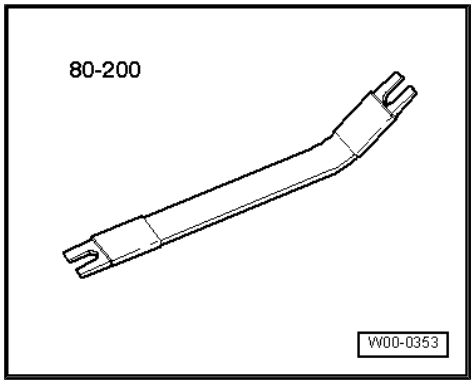
6.3 Adjusting assembly mountings

Special tools and workshop equipment required

♦ Support bracket - 10 - 222 A-



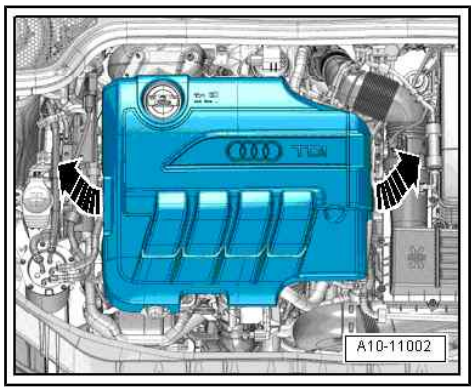
♦ Removal lever - 80 - 200-



Procedure

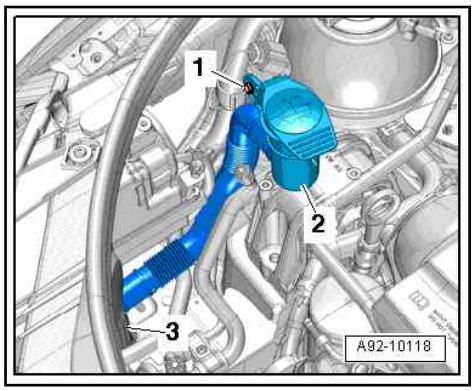
- Tightening torques
  ⇒ “6.1 Exploded view - assembly mountings”, page 44

– Remove engine cover panel -arrows-.



– Remove bolt -1-.

– Push filler pipe with filler neck -2- for washer fluid reservoir to side.



Note

♦ *Disregard -item 3-.*

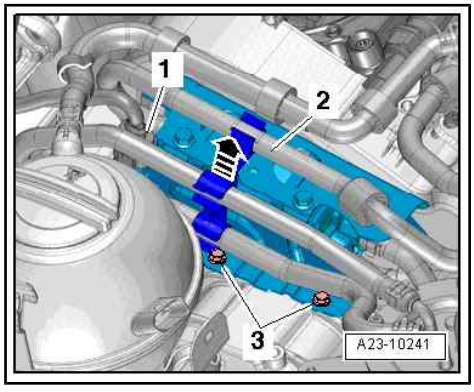
♦ *For illustration purposes, the installation position is shown with the fuel filter removed.*

– Disengage fuel hose -2- at bracket.

– Pull off bracket for fuel lines upwards -arrow- and move clear to one side.

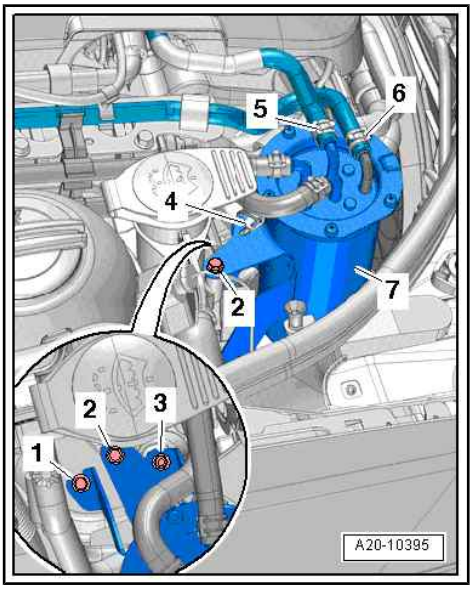
– Unplug electrical connector -1- at supplementary fuel pump - V393- .

– Remove bolts -3-, detach bracket with supplementary fuel pump - V393- and move clear to one side.

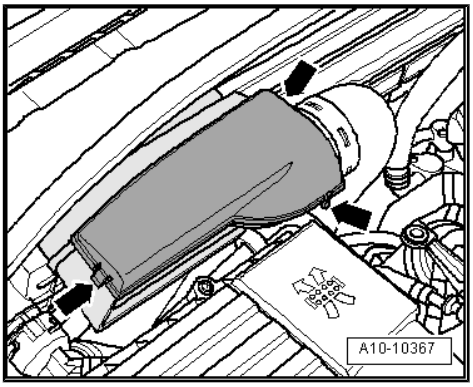


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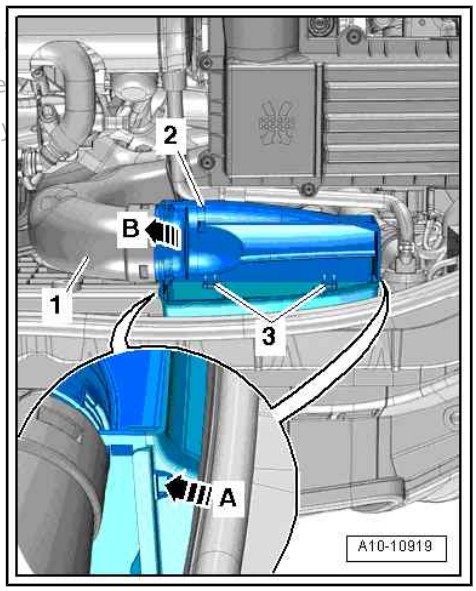
– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach hose retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



– Pull cover off air duct (release clips on sides) -arrows-.

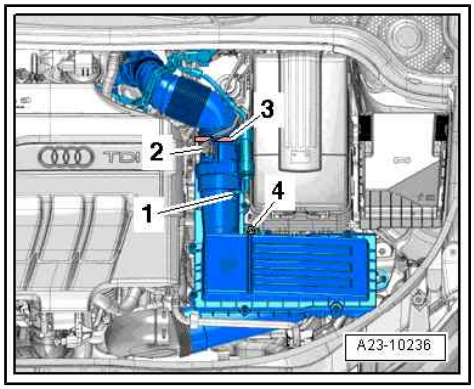


– Release clips on left and right -arrow A- and unclip air duct at bottom -2-.
– Swivel air duct (bottom) slightly to the rear and detach air duct (bottom) from retainers -3-.
– Detach air pipe -1- from air duct (bottom) -arrow B-.



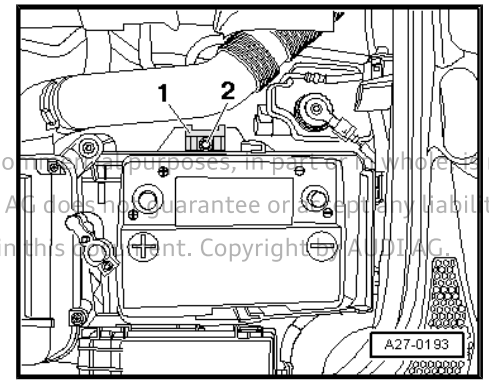
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– Unplug electrical connector -2- at air mass meter - G70- .
– Detach hose -1-.
– Release hose clip -3- and detach air hose.
– Unscrew bolt -4- and remove air cleaner housing.

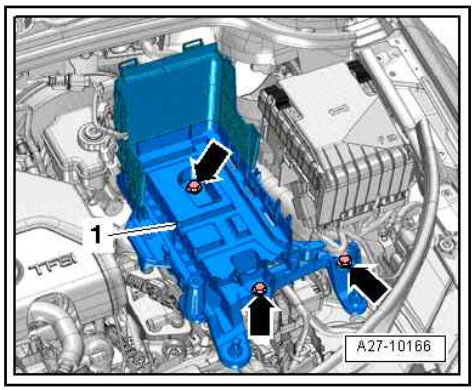


– Remove battery ⇒ Electrical system; Rep. gr. 27 .

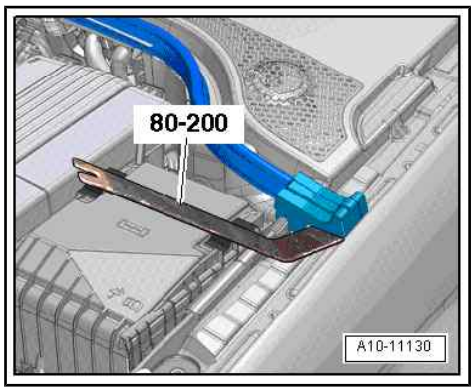
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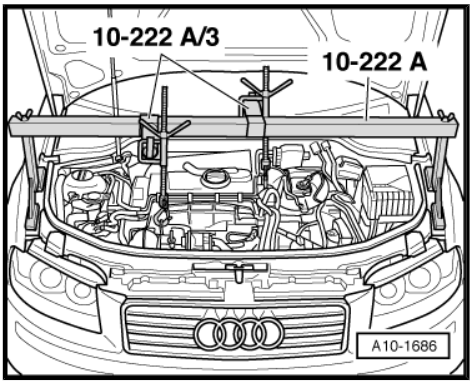
– Remove bolts -arrows- and take out battery tray -1-.



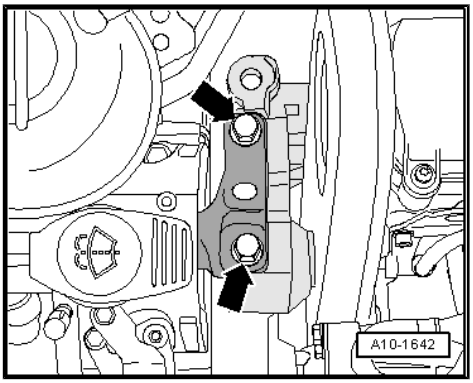
– Unclip sealing element using removal lever - 80 - 200- .



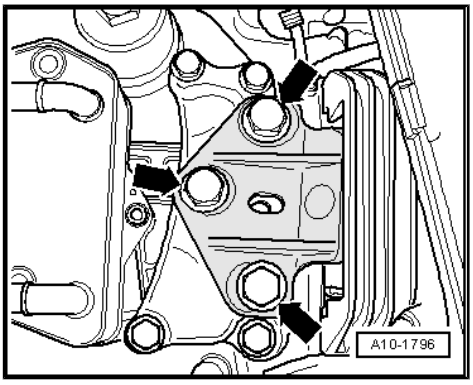
– Set up support bracket - 10 - 222 A- with adapters -10 - 222 A /3- on bolted flanges of wing panels.
– Attach hooks of spindles to engine lifting eyes.
– Take up weight of engine/gearbox assembly evenly with both spindles; do not lift.



– Remove bolts -arrows- for assembly mounting (engine end) one by one and renew (if they were not renewed when installing engine).
– Initially fit bolts hand-tight.

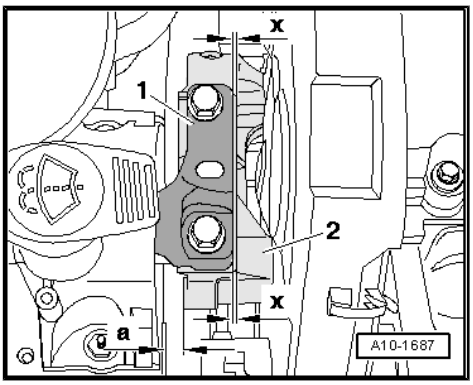


– Remove bolts -arrows- for assembly mounting (gearbox end) one by one and renew (if they were not renewed when installing engine).
– Initially fit bolts hand-tight.



– Using assembly lever, adjust engine/gearbox assembly between engine mounting and support arm -1- until specifications listed below are attained:

- There must be a distance of -a- = 13.5 mm between engine support -2- and longitudinal member (right-side).
- The side of the engine support casting -2- must be aligned parallel to the support arm -1- (distance -x- is the same on both sides).



Note

Distance -a- = 13.5 mm can also be checked with a metal rod of suitable size, or similar.

– Tighten bolts for assembly mounting (engine end).

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– Ensure that edges of support arm (on gearbox side) -2- and gearbox mounting -1- are parallel.

• Dimension -x- must be identical on both sides of mounting.

– Tighten bolts for assembly mounting (gearbox end).

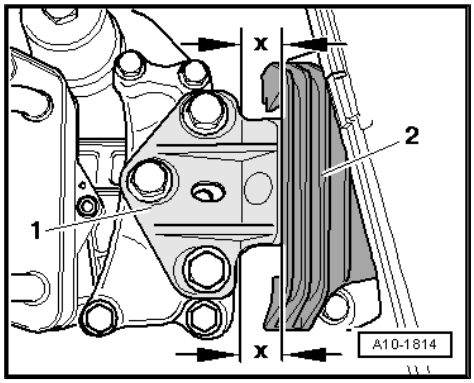
Installation is carried out in reverse order; note the following:

– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .

– Install air cleaner housing ⇒ Rep. gr. 23 .

– Install supplementary fuel pump - V393- and fuel filter ⇒ Rep. gr. 20 .

– Install filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .



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13 – Crankshaft group

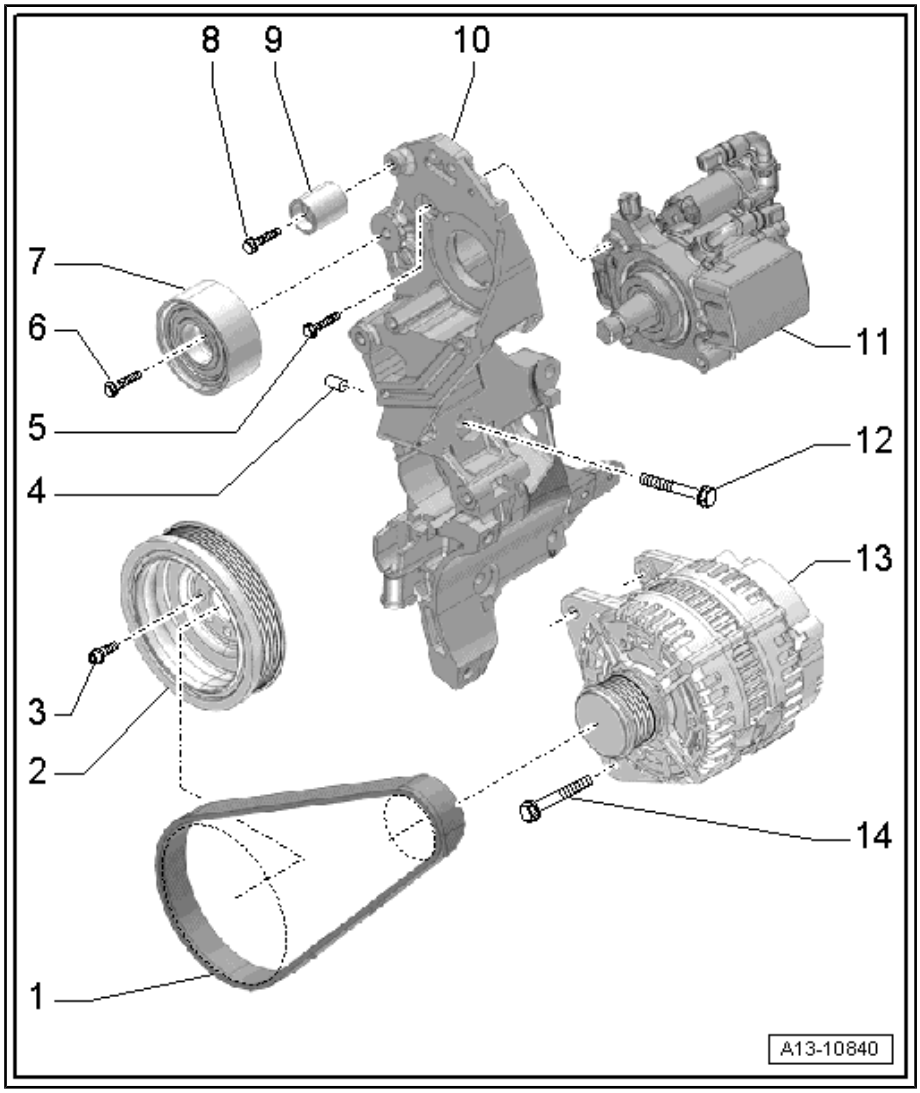
1 Cylinder block (pulley end)

Overview

- ⇒ “1.1 Exploded view - poly V-belt drive, vehicles without air conditioner compressor”, page 53
- ⇒ “1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor”, page 55
- ⇒ “1.3 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioner”, page 55
- ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 57
- ⇒ “1.5 Removing and installing tensioner for poly V-belt”, page 59
- ⇒ “1.6 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioning roller”, page 61
- ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 63
- ⇒ “1.8 Removing and installing vibration damper”, page 65
- ⇒ “1.9 Removing and installing bracket for ancillaries”, page 66
- ⇒ “1.10 Exploded view - sealing flange (pulley end)”, page 69
- ⇒ “1.11 Renewing crankshaft oil seal (pulley end)”, page 70
- ⇒ “1.12 Removing and installing sealing flange (pulley end)”, page 72

1.1 Exploded view - poly V-belt drive, vehicles without air conditioner compressor

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1 - Poly V-belt
- ❑ Renew.
- ❑ Removing and installing ⇒ page 55

2 - Vibration damper
- ❑ With poly V-belt pulley
- ❑ Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- ❑ Removing and installing ⇒ page 65

3 - Bolt
- ❑ Tightening torque ⇒ Item 4 (page 56)

4 - Dowel sleeve
- ❑ 2x
- ❑ Ensure correct seating in bracket for ancillaries

5 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

6 - Bolt
- ❑ Tightening torque ⇒ Item 22 (page 102)

7 - Idler roller
- ❑ For toothed belt

8 - Bolt
- ❑ Tightening torque ⇒ Item 8 (page 101)

9 - Idler roller
- ❑ For toothed belt

10 - Bracket for ancillaries
- ❑ Removing and installing ⇒ page 66

11 - High-pressure pump
- ❑ Removing and installing ⇒ Rep. gr. 23

12 - Bolt
- ❑ Different lengths ⇒ page 57
- ❑ Tightening torque and sequence ⇒ page 57

13 - Alternator
- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 27

14 - Bolt
- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

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1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor

Note

The poly V-belt tensioner is not installed on vehicles without air conditioner (equipment version).

Special tools and workshop equipment required

- Poly V-belt repair set with assembly tool ⇒ Electronic parts catalogue

Procedure

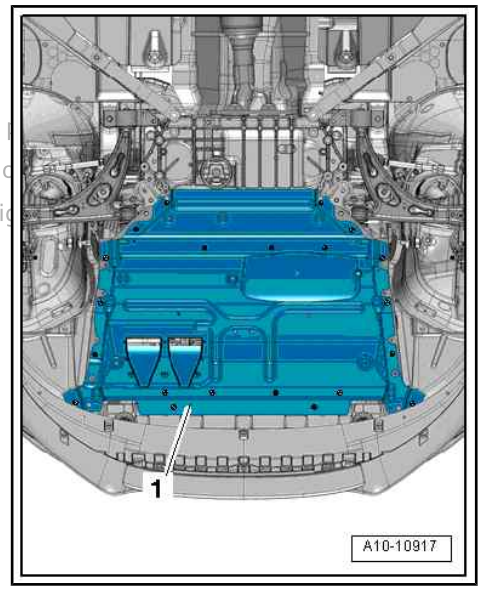
Note

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The poly V-belt repair set with assembly tool contains the assembly tool -T10367- and illustrated instructions.

– Remove front right wheel.

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– A3 Cabriolet: Remove front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .

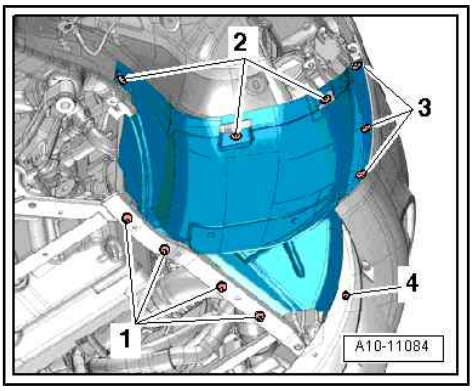
– Follow procedure specified in illustrated instructions.

Installation is carried out in reverse order; note the following:

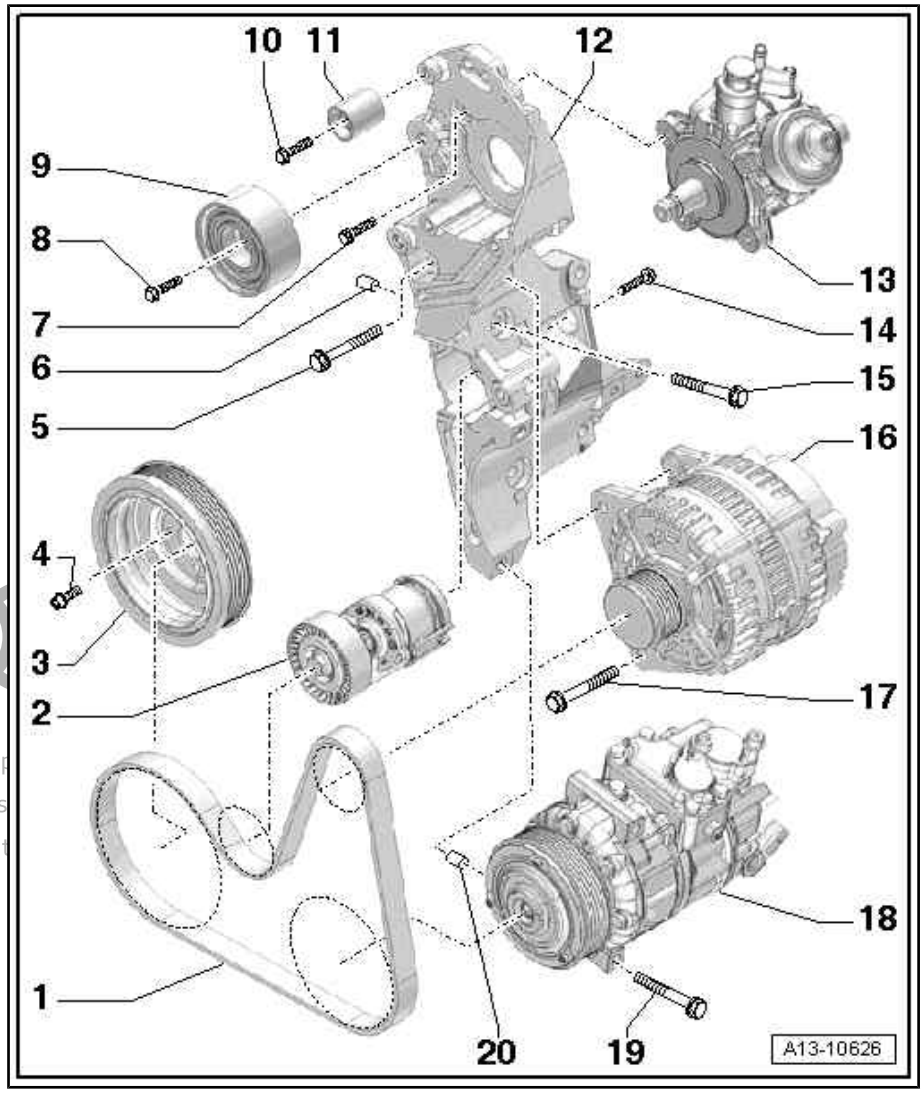
– A3 Cabriolet: Install front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .

– Install noise insulation ⇒ Rep. gr. 50 .

– Fit front wheel (right-side) ⇒ Wheels and tyres; Rep. gr. 44 .



1.3 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioner



1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing: vehicles with tensioner ⇒ page 57 , vehicles without tensioner ⇒ page 55 .
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys.

2 - Poly V-belt tensioner

- ❑ Removing and installing ⇒ page 59
- ❑ Not installed on vehicles without air conditioner (equipment version)

3 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- ❑ Removing and installing ⇒ page 65

4 - Bolt

- ❑ Renew
- ❑ Use only genuine bolts ⇒ Electronic parts catalogue
- ❑ 10 Nm +90°

5 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

6 - Dowel sleeve

- ❑ Ensure correct seating in bracket for ancillaries

7 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

8 - Bolt

- ❑ Tightening torque ⇒ Item 22 (page 102)

9 - Idler roller

- ❑ For toothed belt

10 - Bolt

- ❑ Tightening torque ⇒ Item 8 (page 101)

11 - Idler roller

- ❑ For toothed belt

12 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 66

13 - High-pressure pump

- ❑ Removing and installing ⇒ Rep. gr. 23

14 - Bolt

- ❑ Bolt can be re-used; tightening torque for re-used bolt: 20 Nm + 90°
- ❑ New bolt: 20 Nm +180°

15 - Bolt

- ❑ Tightening torque and sequence ⇒ page 57

16 - Alternator

- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 27

17 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

18 - Air conditioner compressor

- ❑ Removing and installing ⇒ Rep. gr. 87

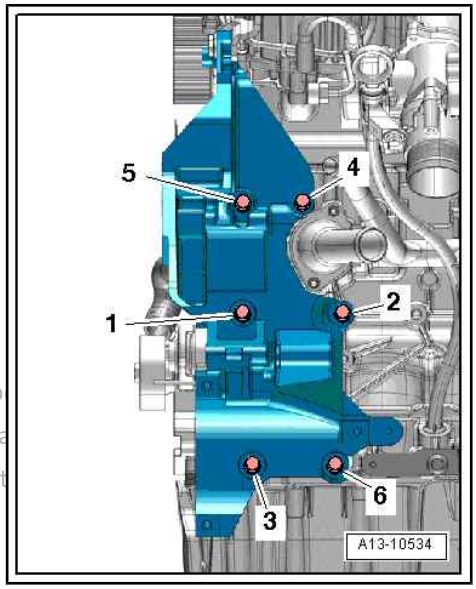
19 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 87

20 - Dowel sleeve

- ❑ Ensure correct seating in bracket

Bracket for ancillaries - tightening torque and tightening sequence



Note

Renew bolts tightened with specified tightening angle.

– Fit bolts in the following sequence:

♦ Bolts -1- and -2- M10x52.

♦ Bolts -3- and -6- M10x30.

♦ Bolts -4- and -5- M10x60.

– Tighten bolts in 4 stages in the sequence shown:

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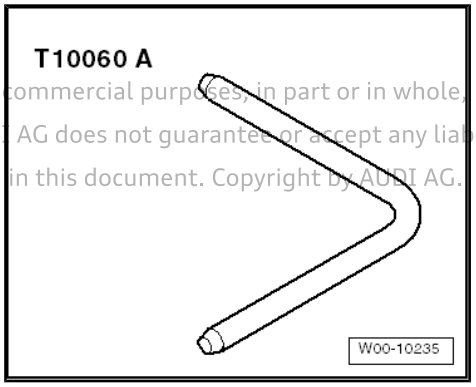
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 6-	Screw in by hand until contact is made
2.	-1 … 6-	40 Nm
3.	-3- and -6-	Turn 45° further
4.	-1, 2, 4, 5-	Turn 90° further

1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner

Special tools and workshop equipment required

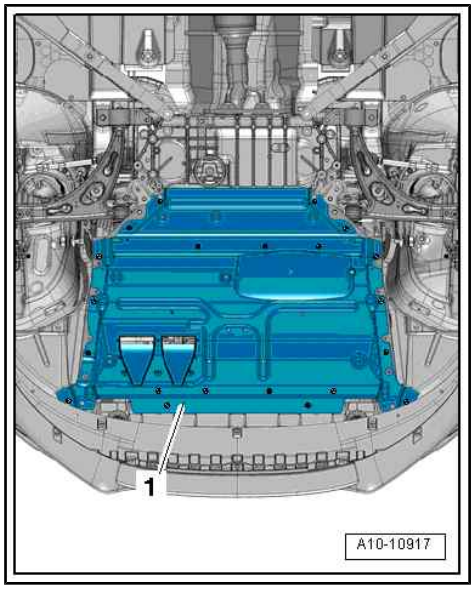
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♦ Locking pin - T10060 A-

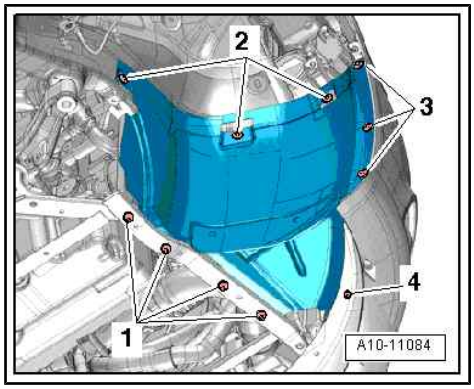


Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



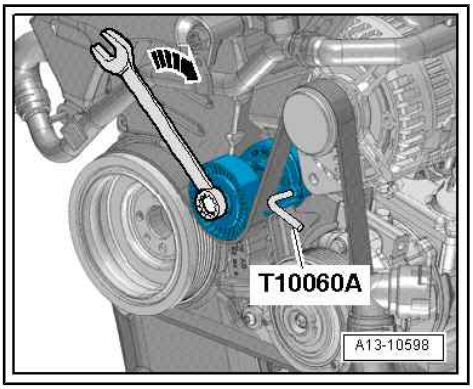
– A3 Cabriolet: Remove front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .



Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*



– Move tensioner in clockwise direction -arrow- to slacken poly V-belt.
– Lock tensioner with locking pin - T10060 A- .
– Take off poly V-belt.

Installing

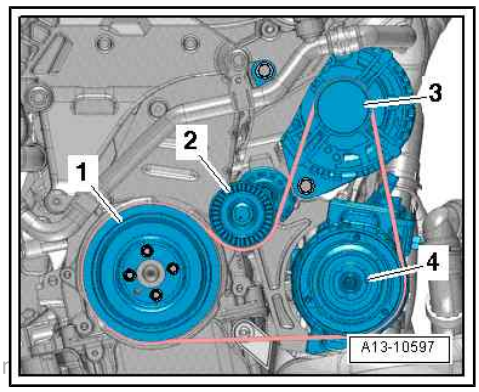
Installation is carried out in reverse order; note the following:

Note

Before fitting poly V-belt, make sure all mechanical units (alternator and air conditioner compressor) are firmly in position.

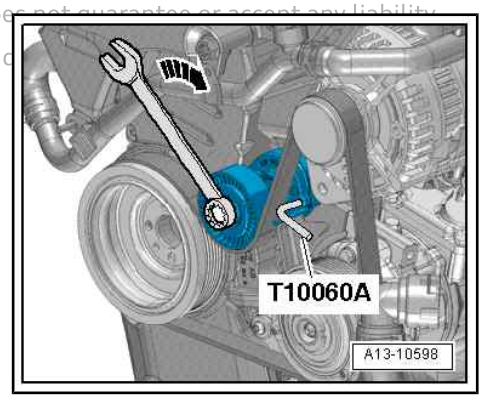
– Fit poly V-belt on poly V-belt pulleys:

1 - Vibration damper
2 - Tensioner
3 - Alternator
4 - Air conditioner compressor



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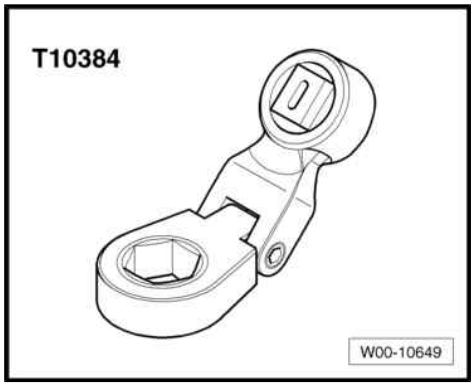
– Hold tensioner with ring spanner and remove locking pin - T10060 A- .
– Release tensioner.
– Check that poly V-belt is in correct position.
– Start engine and check that poly V-belt(s) run properly.
– A3 Cabriolet: Install front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .
– Install noise insulation ⇒ Rep. gr. 50 .



1.5 Removing and installing tensioner for poly V-belt

Special tools and workshop equipment required

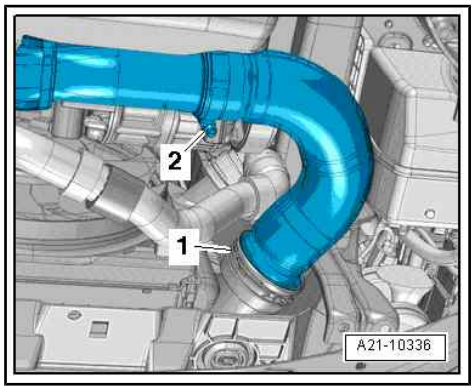
♦ Ratchet wrench 13 mm - T10384-



Removing

– Detach poly V-belt from tensioner
⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 57 .

– Release hose clip -2-, lift retaining clip -1- slightly and remove air hose.

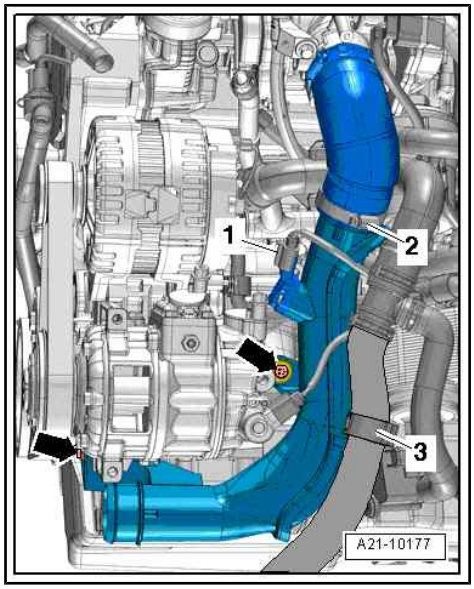


– Remove bolts -arrows-.

– Move coolant hose -3- clear.

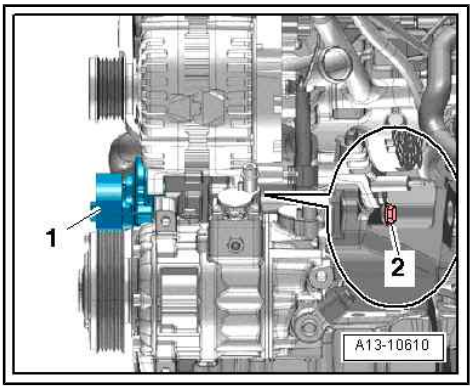
– Release hose clip -2-.

– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe.



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– Remove bolt -2- and take off poly V-belt tensioner -1-.



Note

- *If bolt -2- makes contact, leave it in installation position.*
- *Due to lack of space, the tensioner must be guided out upwards by rotating it.*

Installing

Installation is carried out in reverse order; note the following:

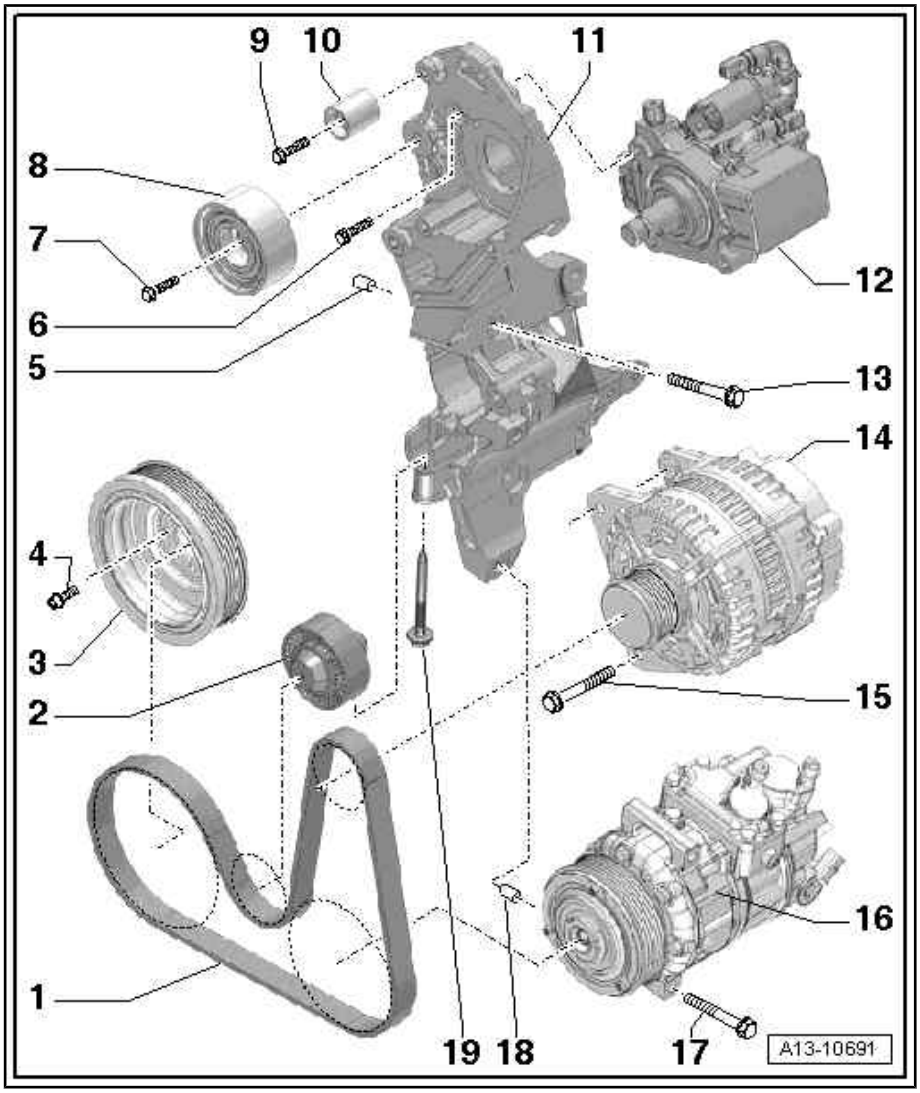
- Tightening torque ⇒ “1.3 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioner”, page 55

– Install air pipe ⇒ page 268 .

– Install poly V-belt ⇒ page 57 .

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1.6 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioning roller



1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ page 63
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on pulleys

2 - Tensioning roller for poly V-belt

- ❑ Removing and installing ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 63
- ❑ Coat contact surfaces with lubricating paste; for lubricating paste refer to ⇒ Electronic parts catalogue

3 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Installation position: hole in vibration damper must be positioned over raised section of crankshaft sprocket
- ❑ Removing and installing ⇒ page 65

4 - Bolt

- ❑ Tightening torque ⇒ Item 4 (page 56)

5 - Dowel sleeve

- ❑ Ensure correct seating in bracket for ancillaries

6 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

7 - Bolt

- ❑ Tightening torque ⇒ Item 22 (page 102)

8 - Idler roller

- ❑ For toothed belt

9 - Bolt

- ❑ Tightening torque ⇒ Item 8 (page 101)

10 - Idler roller

- ❑ For toothed belt

11 - Bracket for ancillaries

- ❑ Removing and installing ⇒ page 66

12 - High-pressure pump

- ❑ Removing and installing ⇒ Rep. gr. 23

13 - Bolt

- ❑ Tightening torque and sequence ⇒ page 57

14 - Alternator

- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 27

15 - Bolt

- ❑ Tightening torque ⇒ Electrical system; Rep. gr. 27

16 - Air conditioner compressor

- ❑ Removing and installing ⇒ Rep. gr. 87

17 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 87

18 - Dowel sleeve

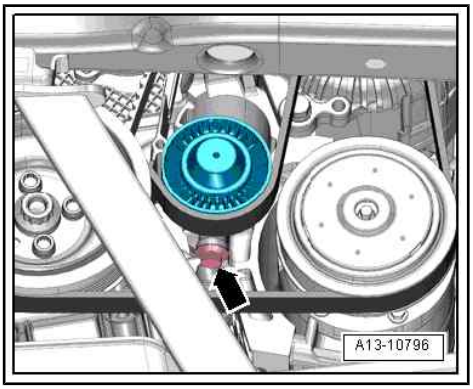
- ❑ Ensure correct seating in bracket for ancillaries

19 - Bolt

- ❑ Tightening torque and sequence ⇒ page 63

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Tensioning roller for poly V-belt - tightening torque and tightening sequence



Note

- *Renew bolt for tensioning roller.*
- *Use a brush to coat guide surfaces of tensioning roller with lubricating paste; lubricating paste ⇒ Electronic parts catalogue .*

– Tighten bolt in 5 stages as follows:

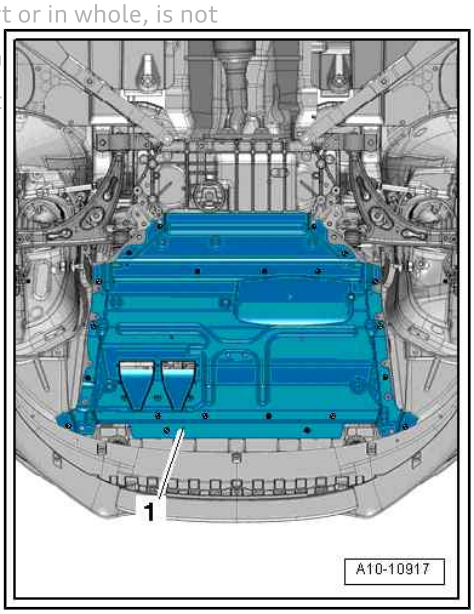
Stage	Bolt	Tightening torque/angle specification
1.	-arrow-	Screw in by hand until contact is made • The poly V-belt is tensioned
2.	-arrow-	Turn until the pin on the tensioning roller has contacted the stop • The poly V-belt is tensioned further
3.	-arrow-	Loosen by 90°
4.	-arrow-	30 Nm
5.	-arrow-	Turn 90° further

1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller

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Removing

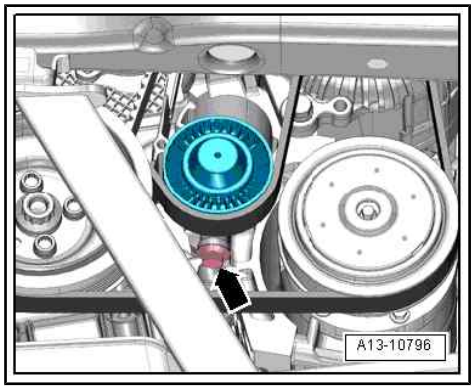
– Remove noise insulation -1- ⇒ Rep. gr. 50 .



Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- ***Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.***



– Remove tensioning bolt -arrow- and detach tensioning roller to slacken poly V-belt.

– Take off poly V-belt.

Installing

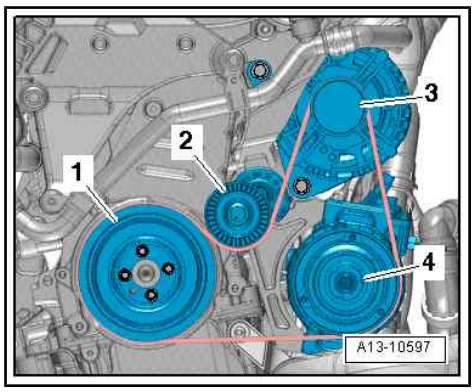
Installation is carried out in reverse order; note the following:

Note

- *Renew bolt for tensioning roller.*
- *Before fitting poly V-belt, make sure all mechanical units (alternator and air conditioner compressor) are firmly in position.*

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– Fit poly V-belt on poly V-belt pulleys:



1 - Vibration damper

2 - Tensioning roller

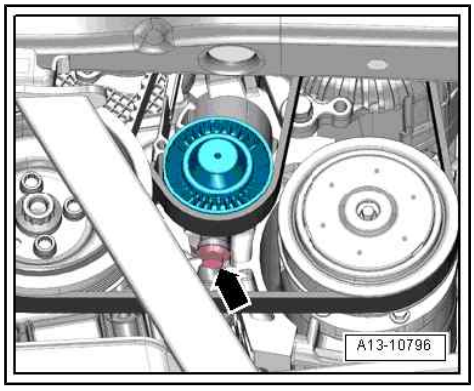
3 - Alternator

4 - Air conditioner compressor

– Use a brush to coat guide surfaces of tensioning roller with lubricating paste; lubricating paste ⇒ Electronic parts catalogue .

– Insert tensioning roller with pin into guide on bracket for ancillaries.

– Tightening bolt for tensioning roller ⇒ page 63 .



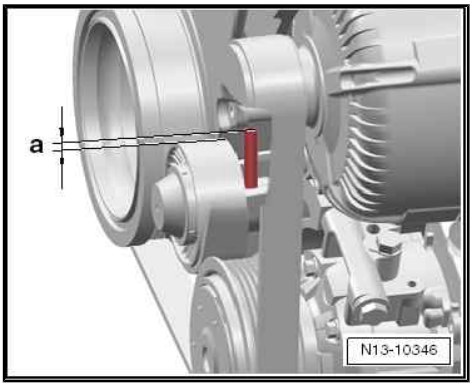
– Check that end of bolt for tensioning roller protrudes beyond contact surface of tensioning roller as far as dimension -a-.

• Distance -a- = approx. 2.5 mm.

• This ensures that the pin is at its limit stop.

– Start engine and check that poly V-belt(s) run properly.

– Install noise insulation ⇒ Rep. gr. 50 .



1.8 Removing and installing vibration damper

Removing

• Front wheel housing liner removed (front section, right-side) ⇒ Rep. gr. 66 .

– Remove poly V-belt:

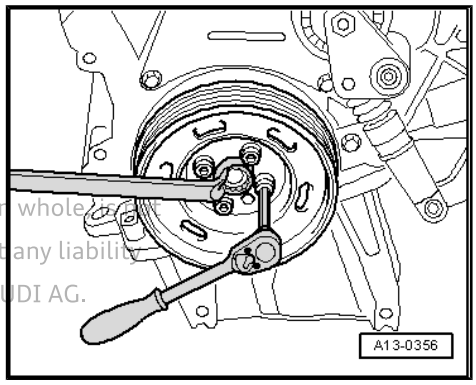
◆ ⇒ “1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor”, page 55

◆ ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 57

◆ ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 63

– Counterhold by applying ring spanner to bolt for crankshaft sprocket and slacken bolts for vibration damper.

– Remove bolts and take off vibration damper.

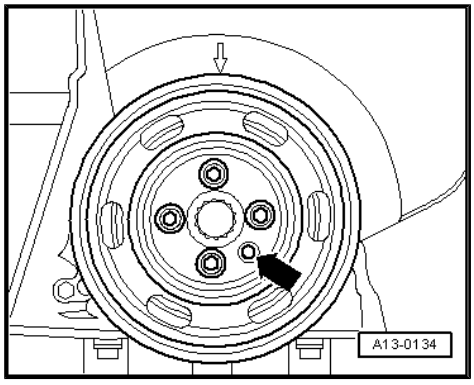


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Installing

Installation is carried out in reverse order; note the following:

- Tightening torque
  ⇒ “1.6 Exploded view - poly V-belt drive, vehicles with air conditioner compressor and tensioning roller”, page 61



Note

Renew bolts tightened with specified tightening angle.

- Installation position: hole -arrow- in vibration damper must be positioned over raised section of crankshaft sprocket.

– Install poly V-belt:

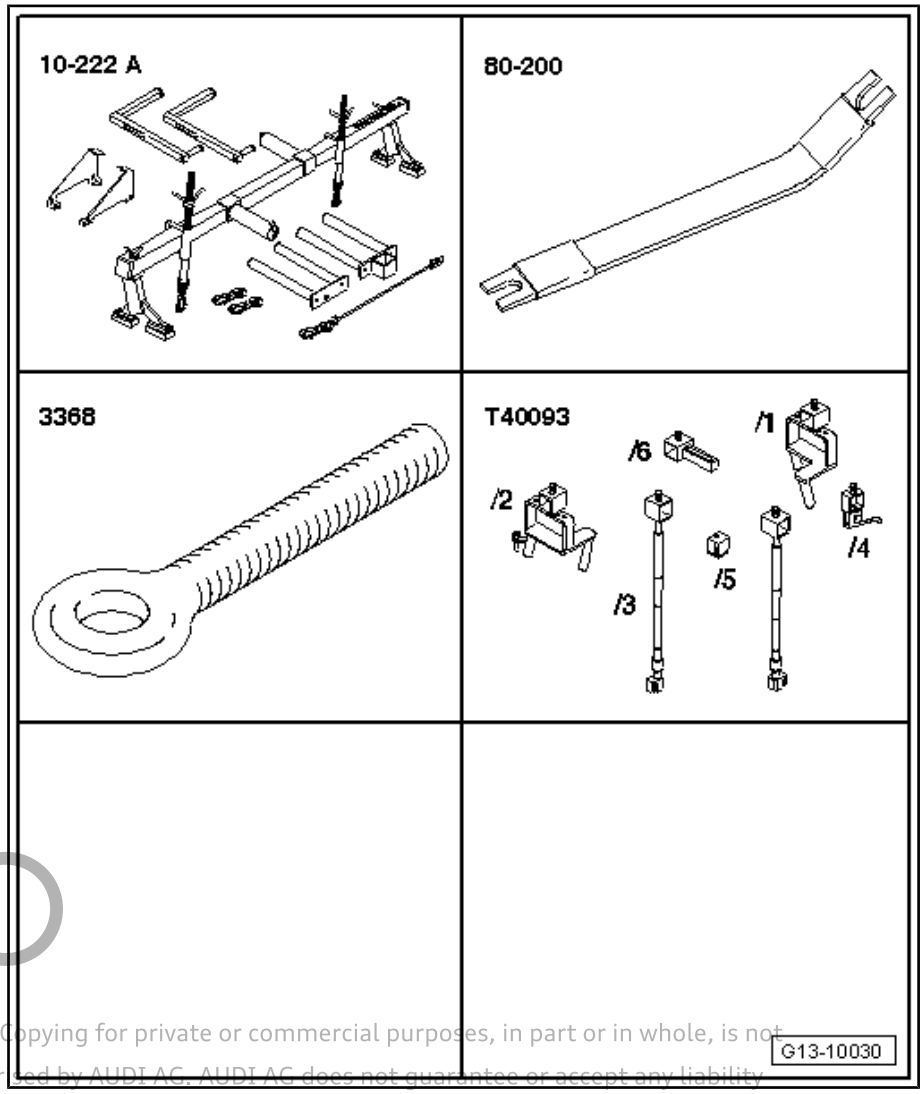
◆ ⇒ “1.2 Removing and installing poly V-belt - vehicles without air conditioner compressor”, page 55

◆ ⇒ “1.4 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioner”, page 57

◆ ⇒ “1.7 Removing and installing poly V-belt - vehicles with air conditioner compressor and tensioning roller”, page 63

1.9 Removing and installing bracket for ancillaries

Special tools and workshop



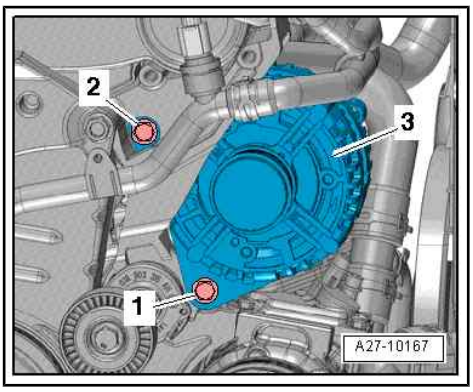
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equipment required

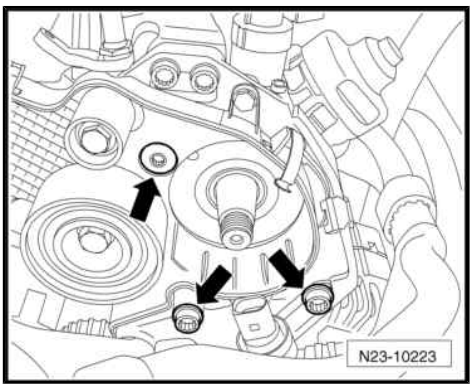
- Support bracket - 10 - 222 A- with hexagon nut - 10 - 222 A / 27-
- Removal lever - 80 - 200-
- Eye-head bolt - 3368-
- Engine support supplement set - T40093-
- Flange nut M10 or nut M10 with washer

Removing

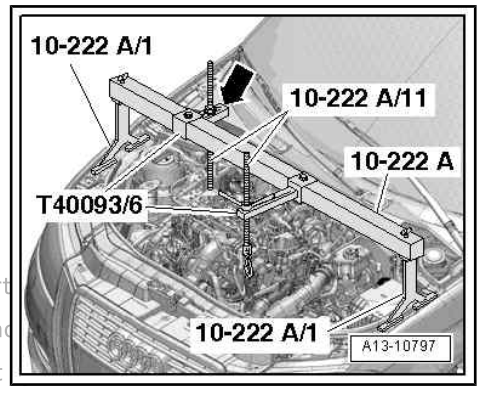
– Remove alternator ⇒ Electrical system; Rep. gr. 27 .



– Remove high-pressure pump ⇒ Rep. gr. 23 .



– Position support bracket - 10 - 222 A- with adapters and spindles on bolted flanges of wing panels as shown in illustration.
– Replace wing nut from spindle - 10 - 222 A /11- (rear right) with hexagon nut - 10 - 222 A /27- -arrow -.
– Attach hook of spindle to engine lifting eye (left-side).

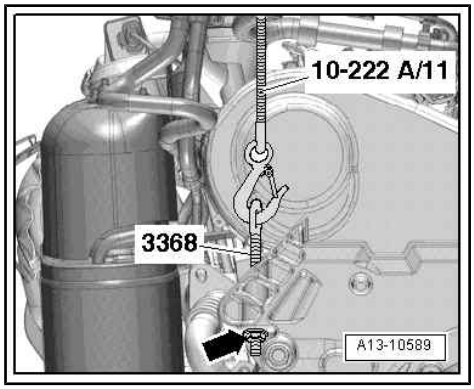


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WARNING

Risk of accident because of loose bolt connections.

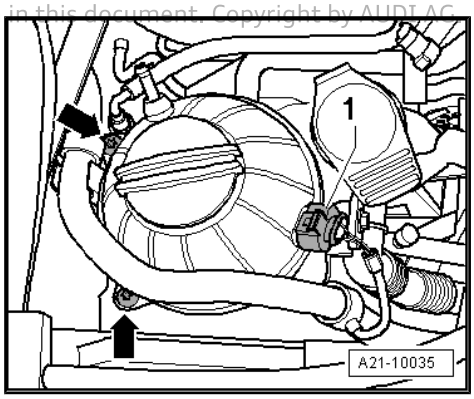
- *Screw on flange nut or nut with washer -arrow- at least 6 turns to ensure that eye-head bolt - 3368- is properly secured.*



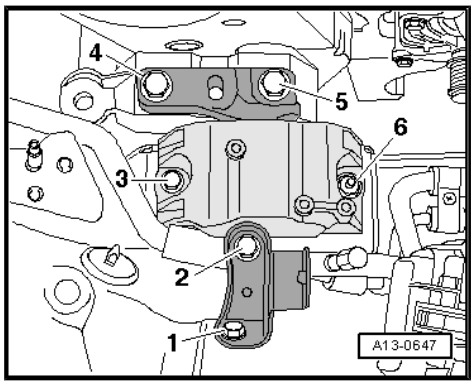
– Secure eye-head bolt - 3368- with flange nut M10 or nut with washer to engine support as shown in illustration.
– Hook spindle - 10 - 222 A /11- (right-side) onto eye-head bolt - 10 - 222 A /27- with hexagon nut - 3368- .
– Take up weight of engine evenly with both spindles (but do not raise engine).

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– Remove bolts -arrows-.
– Detach electrical connector at coolant shortage indicator switch - F66- and move coolant expansion tank to side.



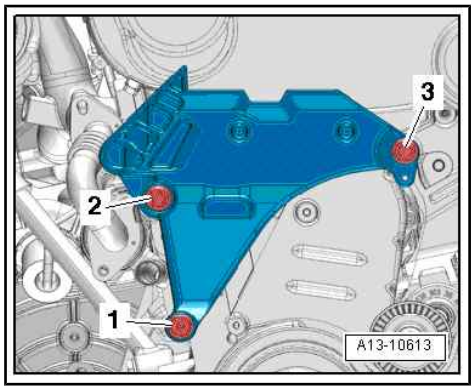
– Remove bolts -1- and -2- and remove connecting bracket.
– Remove bolts -3 ... 6- and detach engine mounting.



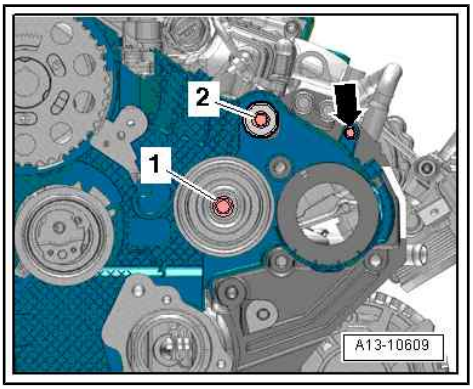
– Remove bolt -3- on engine support.

Note

Disregard items -1 and 2-.



– Remove bolt -arrow-.
– Remove bolts -1- and -2- and remove idler rollers for toothed belt.



– Remove bolts -1 ... 6- and detach bracket for ancillaries.

Installing

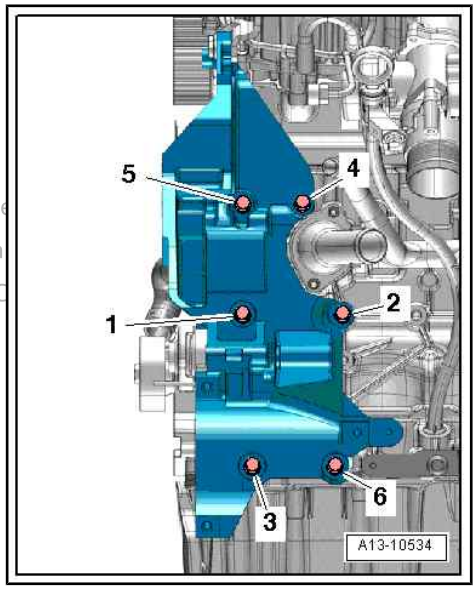
Installation is carried out in reverse order; note the following:

Note

Renew bolts tightened with specified tightening angle.

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– Check that dowel sleeve at top right between bracket for ancillaries and cylinder block is fitted; insert dowel sleeve if necessary.
– Tighten bolts for bracket for ancillaries ⇒ page 57 .
– Install engine support and engine mounting ⇒ page 44 .
– Install high-pressure pump ⇒ Rep. gr. 23 .
– Install toothed belt (adjust valve timing) ⇒ page 110 .
– Install alternator ⇒ Electrical system; Rep. gr. 27 .



1.10 Exploded view - sealing flange (pulley end)

1 - Bolt

- ❑ Tightening torque ⇒ Item 27 (page 102)

2 - Crankshaft sprocket

- ❑ Contact surface between sprocket and crankshaft must be free of oil
- ❑ Can only be installed in one position

3 - Oil seal for crankshaft (pulley end)

- ❑ Renewing ⇒ page 70
- ❑ Do not lubricate with oil

4 - Sealing flange (pulley end)

- ❑ Should be positioned on dowel pins
- ❑ Removing and installing ⇒ page 72

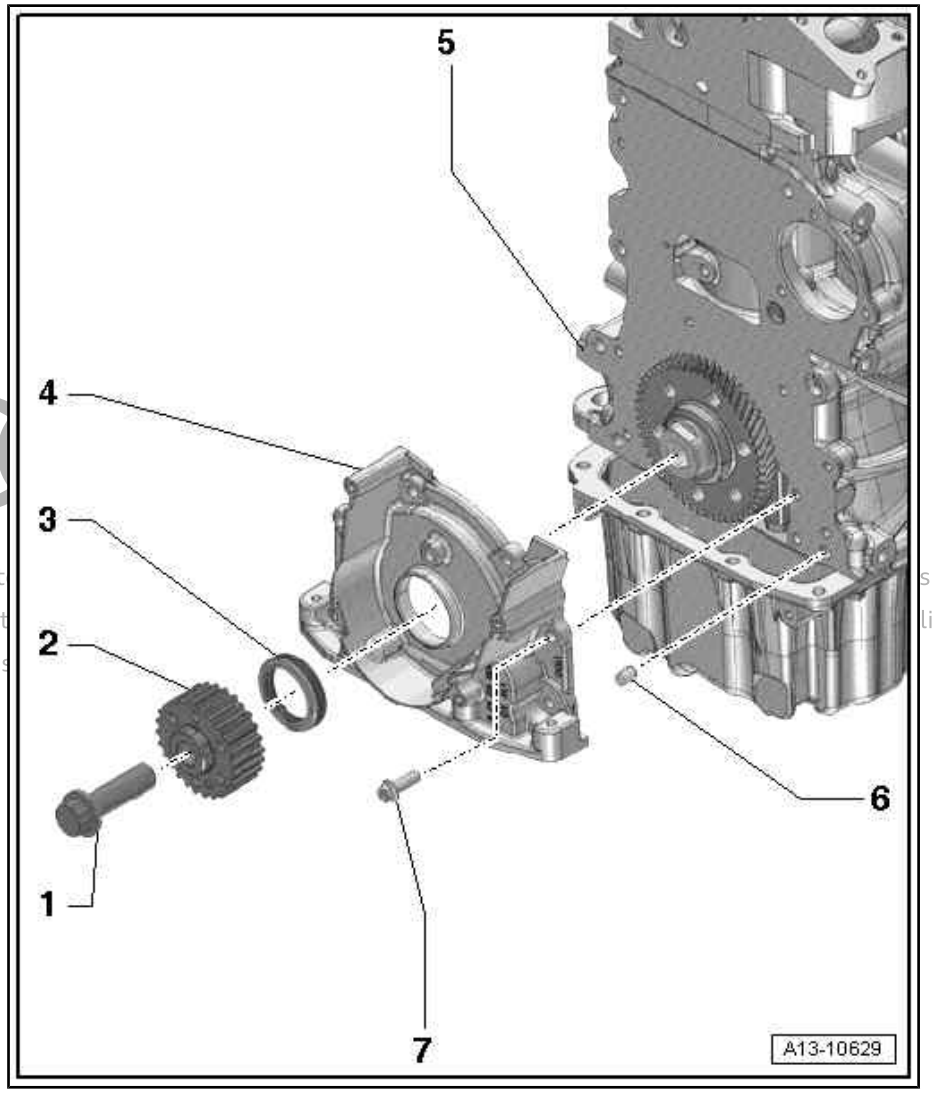
5 - Cylinder block

6 - Dowel pin

- ❑ 2x

7 - Bolt

- ❑ Tightening torque and sequence ⇒ page 70

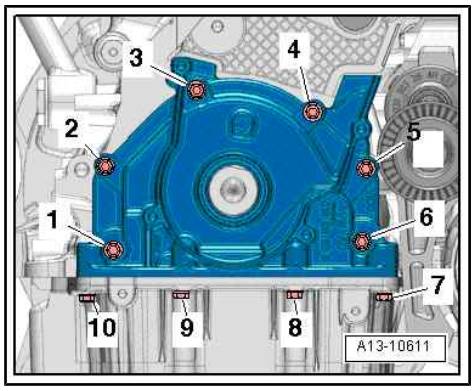


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Sealing flange (pulley end) - tightening torque and sequence

– Tighten bolts in 3 stages in the sequence shown:

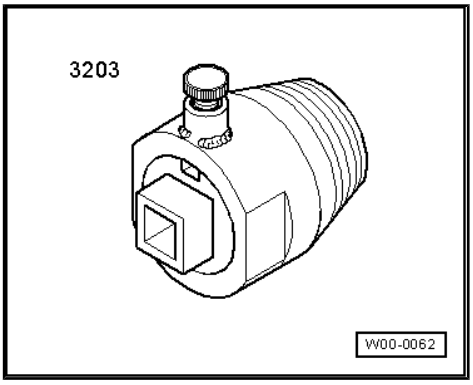
Stage	Bolts	Tightening torque
1.	-1 … 10-	Screw in by hand until contact is made
2.	-1 … 6-	Tighten in stages and in diagonal sequence; final torque 15 Nm
3.	-7 … 10-	15 Nm



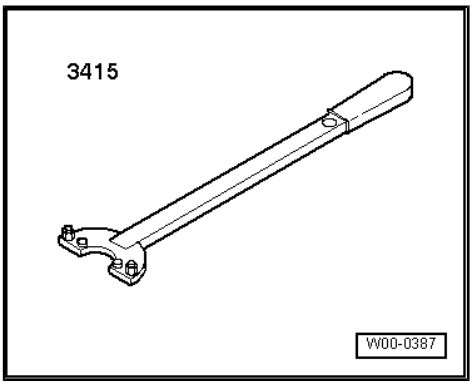
1.11 Renewing crankshaft oil seal (pulley end)

Special tools and workshop equipment required

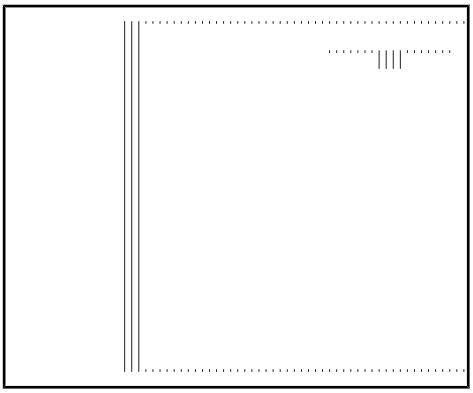
- Oil seal extractor - 3203-



- Counterhold tool - 3415-



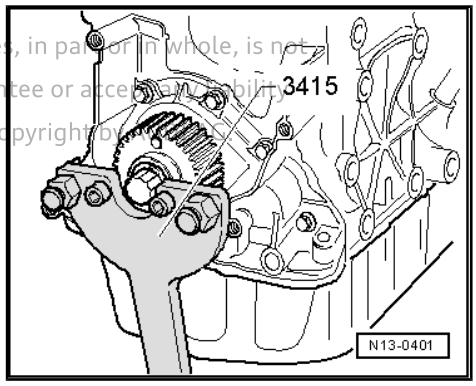
- Assembly tool - T10053-



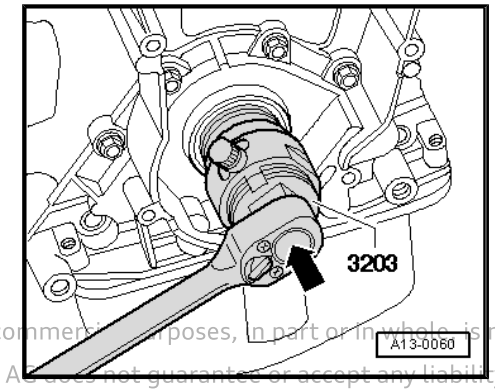
Procedure

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– Remove toothed belt ⇒ page 103 .
– Loosen bolt for crankshaft sprocket using counterhold tool - 3415- .
– Remove bolt and detach crankshaft sprocket.



– Adjust inner section of oil seal extractor -3203- so it is flush with the outer section and lock in position with knurled screw.
– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
– Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.
– Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.
– Clean contact surface and sealing surface for oil seal.
– Remove oil residue from crankshaft journal with a clean cloth.

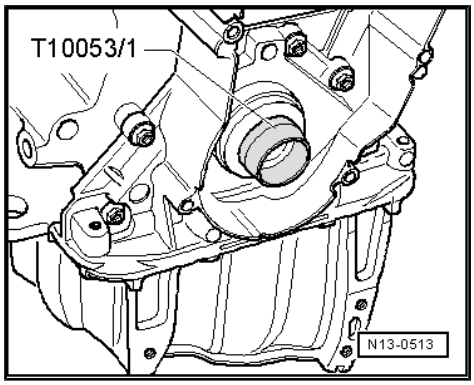


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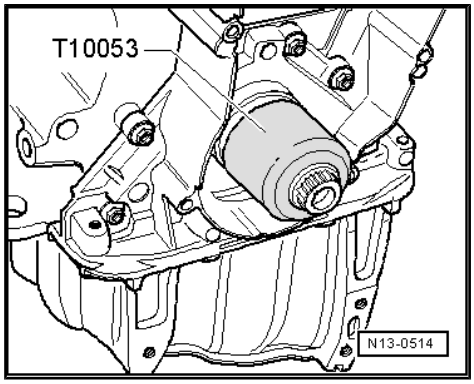
Note

Do not lubricate sealing lip and outer rim of oil seal before pressing in.

– Fit guide sleeve -T10053/1- onto crankshaft journal.
– Push oil seal over guide sleeve onto crankshaft journal.



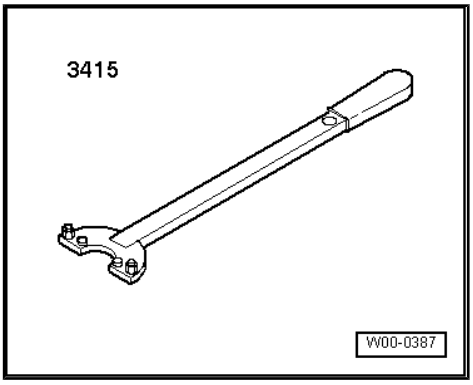
– Press in oil seal using bolt for crankshaft sprocket and thrust sleeve of assembly tool - T10053- until flush.
– Install crankshaft sprocket ⇒ page 101 .
– Install toothed belt (adjust valve timing) ⇒ page 110 .



1.12 Removing and installing sealing flange (pulley end)

Special tools and workshop equipment required

- Counterhold tool - 3415-

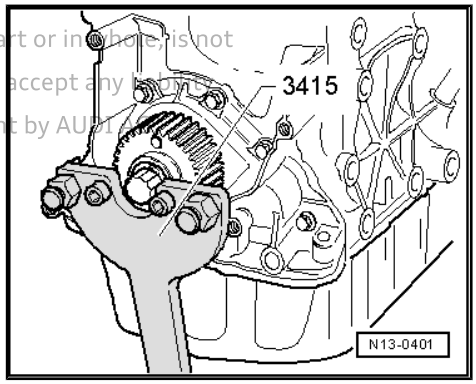


- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

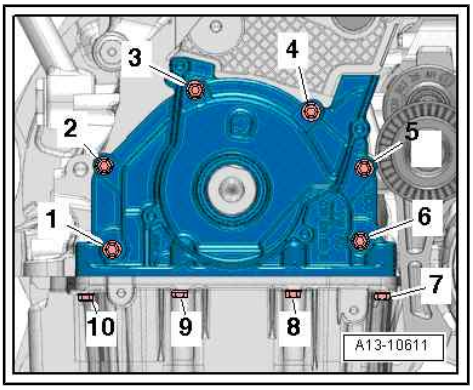
Removing

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– Remove toothed belt ⇒ page 103 .
– Loosen bolt for crankshaft sprocket using counterhold tool -3415- .
– Remove bolt and detach crankshaft sprocket.



– Remove bolts -1 ... 10- and carefully release sealing flange from bonded joint.
– Drive out oil seal with sealing flange removed.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

- ⇒ Fig. ""Sealing flange (pulley end) - tightening torque and sequence"" , page 70
- ⇒ Item 27 (page 102)

Caution

Make sure sealant residue does not enter lubrication system.

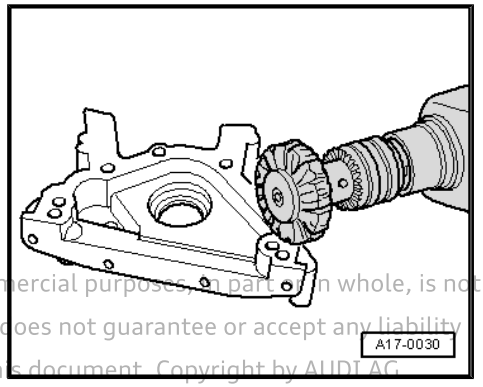
- ***Place a clean cloth over the exposed section of the sump.***

– Carefully remove sealant residue on cylinder block and sump.

WARNING

Risk of eye injury.

- *Put on safety goggles.*



– Use e.g. rotating plastic brush to remove sealant residue on sealing flange.

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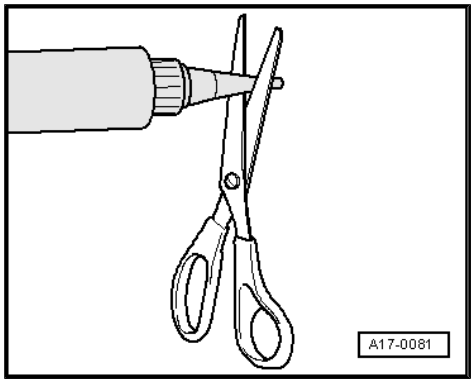
– Clean sealing surfaces; they must be free of oil and grease.

– Check that dowel pins for positioning sealing flange are fitted in cylinder block; insert if necessary.

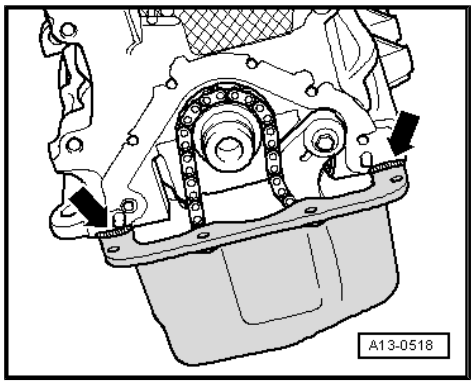
Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



– Apply a thin bead of sealant at the edge of the joint between the cylinder block and the sump -arrows-.



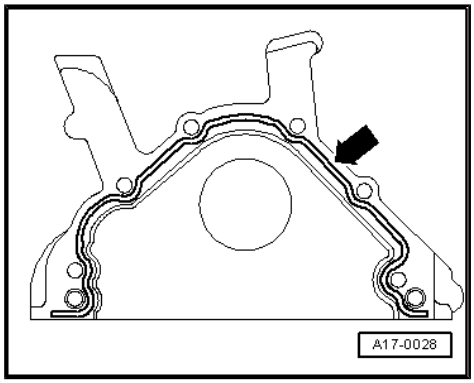
Caution

Make sure lubrication system is not clogged by excess sealant.

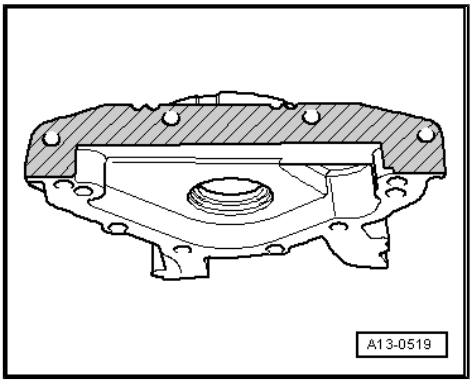
- *The sealant bead must not be thicker than specified.*

– Apply sealant bead -arrow- onto clean sealing surface of sealing flange as shown in illustration.

- Thickness of sealant bead: 2 ... 3 mm



– Apply a thin coat of sealant to bottom sealing surface -shaded- on sealing flange.



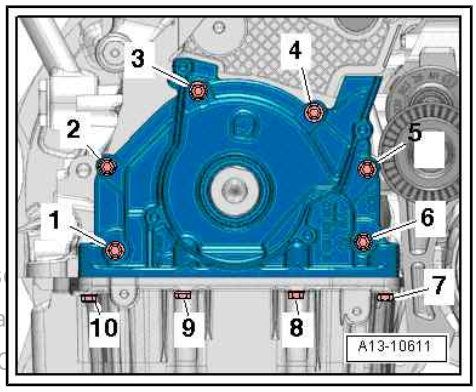
Note

The sealing flange must be installed within 5 minutes after applying the sealant.

– Carefully fit sealing flange onto dowel pins in cylinder block.

– Tighten sealing flange bolts ⇒ page 70 .

– Install crankshaft oil seal (pulley end) ⇒ page 70 .



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2 Cylinder block (gearbox end)

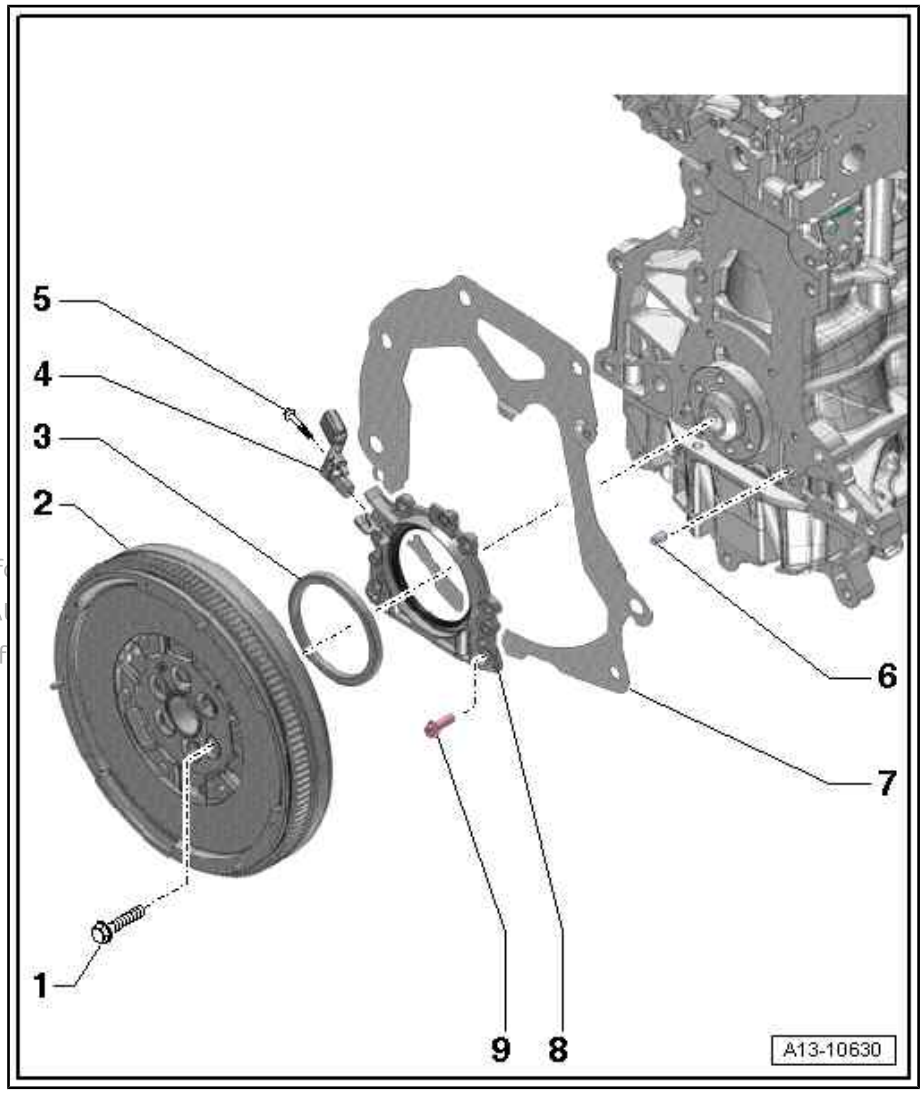
Overview

- ⇒ “2.1 Exploded view - dual-mass flywheel and sealing flange (gearbox end)”, page 76
- ⇒ “2.2 Removing and installing dual-mass flywheel”, page 77
- ⇒ “2.3 Renewing sealing flange (gearbox end)”, page 78

Note

Servicing clutch ⇒ Rep. gr. 30

2.1 Exploded view - dual-mass flywheel and sealing flange (gearbox end)



1 - Bolt
- ❑ Renew
- ❑ 60 Nm +90°

2 - Dual-mass flywheel
- ❑ Removing and installing ⇒ page 77
- ❑ Can only be installed in one position (holes are off-set)

3 - Sender wheel
- ❑ For engine speed sender - G28-
- ❑ Removing and installing ⇒ “2.3 Renewing sealing flange (gearbox end)”, page 78

4 - Engine speed sender - G28-
- ❑ Removing and installing ⇒ Rep. gr. 28

5 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 28

6 - Dowel pin
- ❑ 2x

7 - Intermediate plate
- ❑ Do not damage or bend when assembling
- ❑ Installing ⇒ page 77

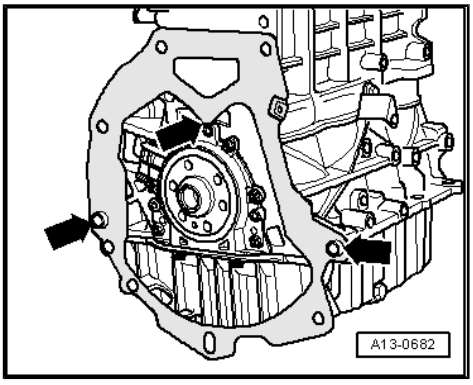
8 - Sealing flange (gearbox end)
- ❑ With oil seal
- ❑ Renewing ⇒ page 78

9 - Bolt
- ❑ Tightening torque and sequence ⇒ page 77

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Installing intermediate plate

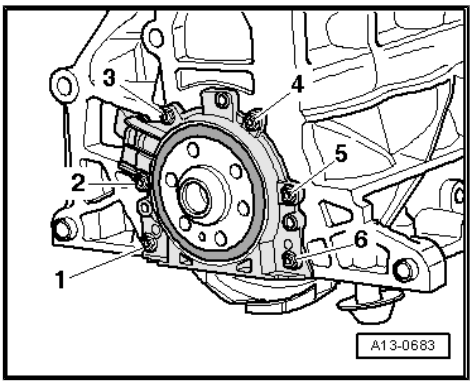
– Engage intermediate plate on sealing flange -top arrow- and push onto dowel sleeves -bottom arrows-.



Sealing flange (gearbox end) - tightening torque and sequence

– Tighten bolts in 2 stages as follows:

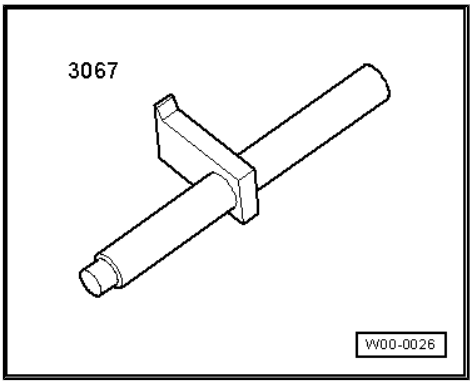
Stage	Bolts	Tightening torque
1.	-1 … 6-	Screw in by hand until contact is made
2.	-1 … 6-	Tighten in stages and in diagonal sequence; final torque 15 Nm



2.2 Removing and installing dual-mass flywheel

Special tools and workshop equipment required

♦ Counterhold tool - 3067-



Removing

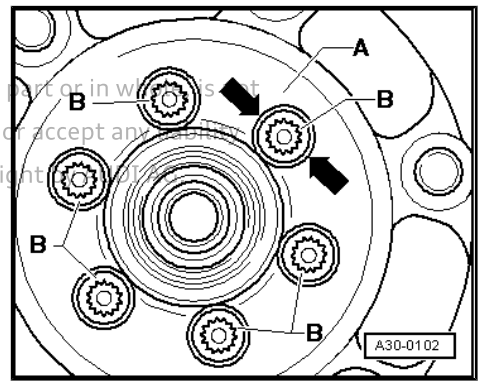
• Gearbox removed

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Caution

Risk of irreparable damage to dual-mass flywheel.

- ***Remove bolts -B- using normal hand tools (do not use pneumatic wrench or impact driver, etc.).***
- ***When removing the bolts, make sure that the bolt heads do not come into contact with the dual-mass flywheel.***
- ***Rotate the dual-mass flywheel -A- so that the bolts -B- align centrally with the holes -arrows-.***

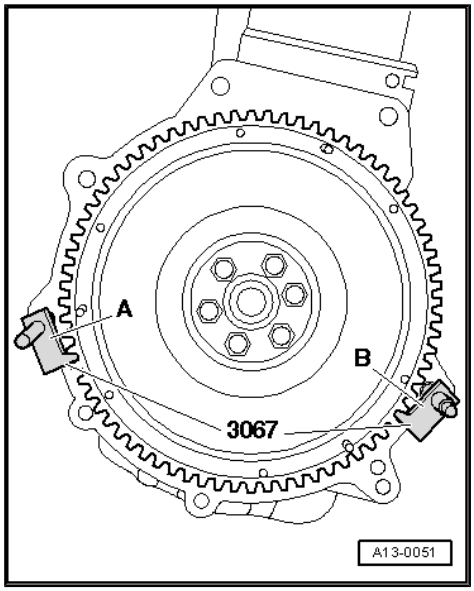


– Insert counterhold tool - 3067- in hole on cylinder block -item B-, slacken bolts for dual-mass flywheel.
– Remove bolts and take off dual-mass flywheel.

Installing

Installation is carried out in reverse order; note the following:

- Tightening torque
⇒ "2.1 Exploded view - dual-mass flywheel and sealing flange (gearbox end)", page 76



Note

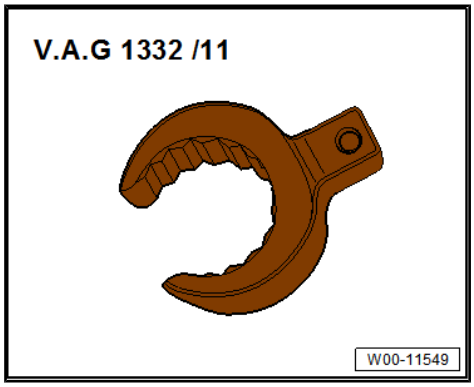
Renew bolts tightened with specified tightening angle.

– Insert counterhold - 3067- in hole on cylinder block -item A-.

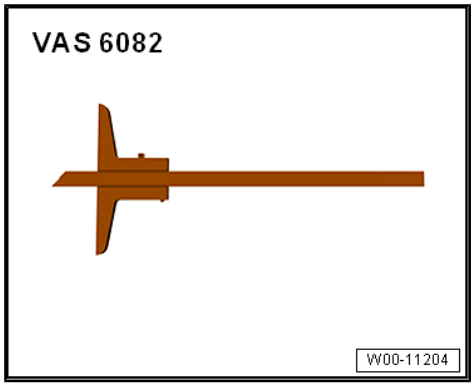
2.3 Renewing sealing flange (gearbox end)

Special tools and workshop equipment required

♦ Open end spanner insert, AF 24 - V.A.G 1332/11-

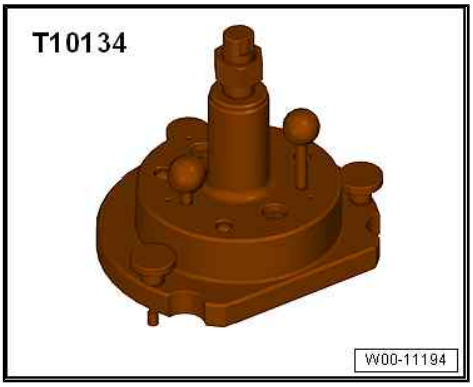


♦ Depth gauge - VAS 6082-



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♦ Assembly tool - T10134-



♦ Bolt, M6x35 (3x)

♦ Bolt, M7x35 (2x)

Pressing out sealing flange with sender wheel

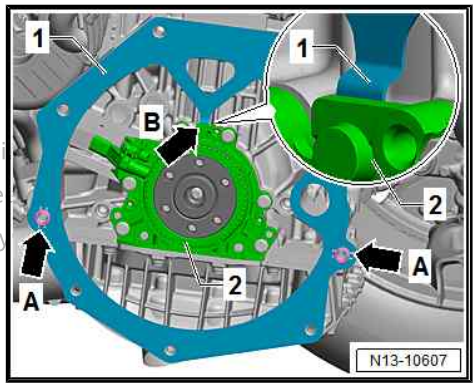
• Gearbox removed

– Remove flywheel ⇒ page 77 .

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Note

For clarity, the engine is removed in the following illustrations.



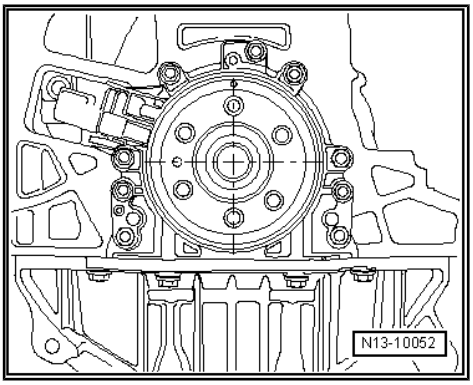
– Detach intermediate plate -1- from dowel sleeves -arrows A-.

– Guide intermediate plate upwards; at the same time, pull retaining tab -arrow B- out of opening behind sealing flange -2-.

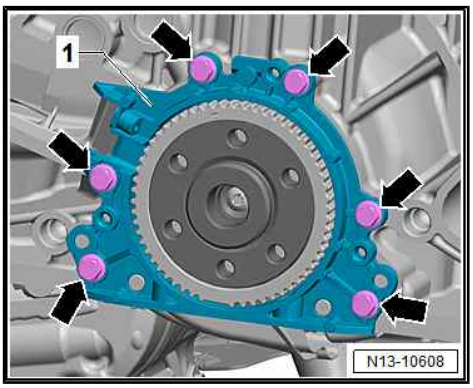
– Rotate crankshaft by turning bolt for toothed belt sprocket until crankshaft is positioned at “TDC”, as shown in illustration.

– Remove sump ⇒ page 165 .

– Remove engine speed sender - G28- ⇒ Rep. gr. 28 .



– Remove bolts -arrows- for sealing flange -1-.

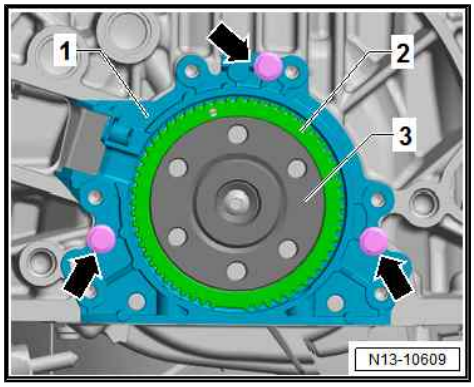


Note

The sealing flange -1- is pressed off the crankshaft -3- together with the sender wheel -2-.

– To press off, screw 3 bolts M6x35 -arrows- alternately into sealing flange not more than $^1/_2$ turn at a time.

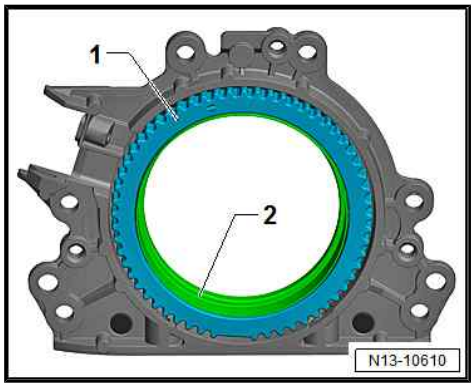
– Detach sealing flange together with sender wheel.



Pressing in sealing flange with sender wheel

Note

- *The sealing flange with PTFE oil seal is fitted with a sealing lip support ring -2-. This support ring acts as an assembly sleeve and must not be removed before installation.*
- *Sealing flange and sender wheel -1- must not be separated or rotated out of position after removal from packaging.*
- *The sender wheel is held in its installation position by a locating pin on the assembly tool - T10134- .*
- *The sealing flange and oil seal are one unit and can only be replaced together with the sender wheel.*
- *The assembly tool - T10134- is held in the correct position relative to the crankshaft by a guide pin which is inserted into a hole in the crankshaft.*



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Construction of assembly tool - T10134- :

A - Tensioning flats

B - Nut

C - Assembly housing

D - Locating pin

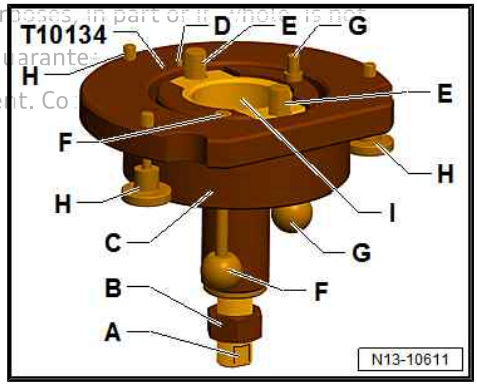
E - Hexagon socket head bolts (2x)

F - Guide pin for diesel engines (black handle)

G - Guide pin for petrol engines (red handle)

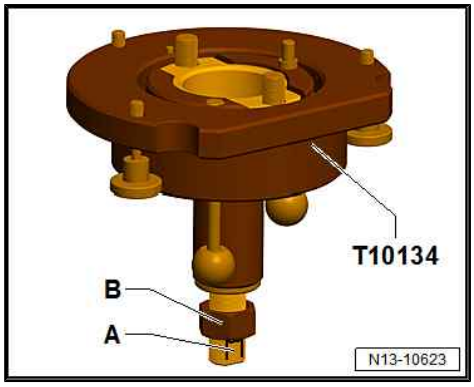
H - Knurled screws (3x)

I - Inner section



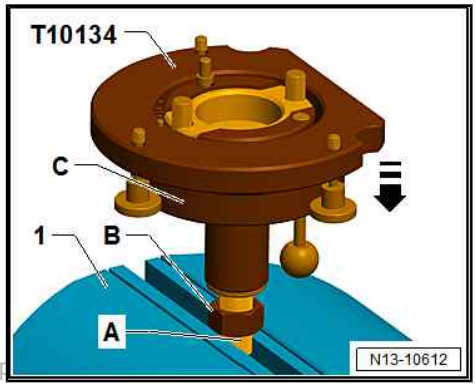
Fitting sealing flange with sender wheel onto assembly tool - T10134- :

– Unscrew nut -B- until it is just in front of tightening flats -A- on threaded spindle.



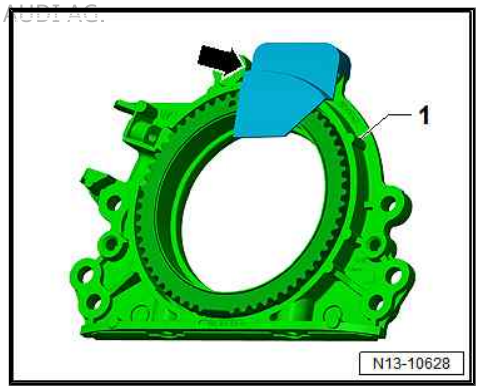
– Clamp assembly tool - T10134- in a vice -1- on tightening flats -A- of threaded spindle.
– Press assembly housing -C- downwards -arrow- so that it rests on nut -B-.

• Inner part of assembly device and assembly housing must align (be level) with each other.



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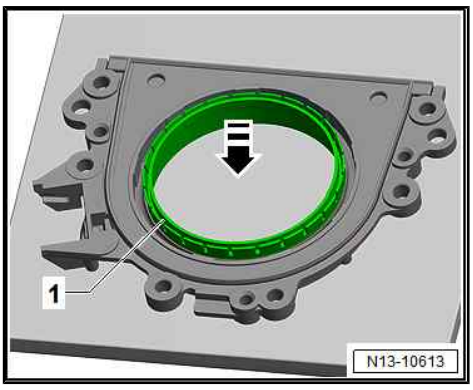
– If fitted, remove securing clip -arrow- from new sealing flange.



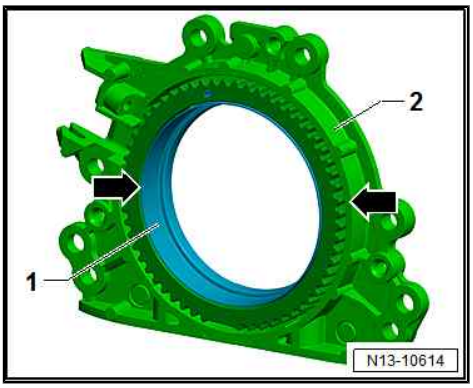
Note

Do not take the sender wheel out of the sealing flange or rotate it out of position.

– Place sealing flange (with front side downwards) on a clean flat surface.
– Press sealing lip support ring -1- downwards in direction of -arrow- until it touches flat surface.

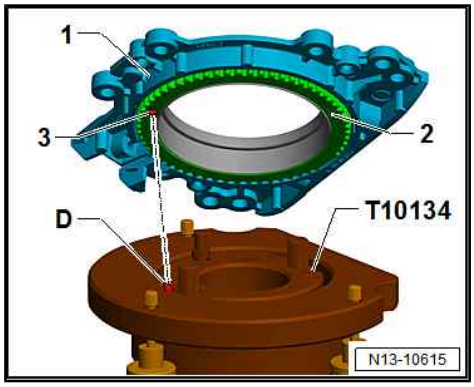


• Upper edge of sealing lip support ring -1- must be flush -arrows- with front edge of sealing flange -2-.



– Place front side of sealing flange -1- on assembly tool - T10134- so that locating pin -D- is seated in hole -3- in sender wheel -2-.

• Ensure that sealing flange lies flat on assembly tool.

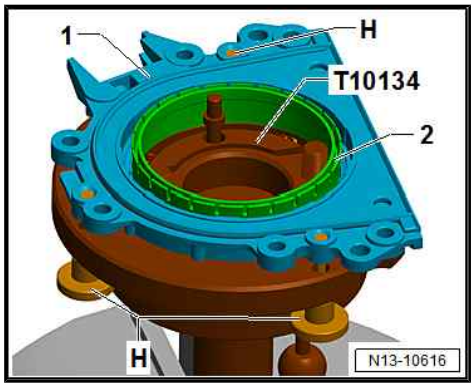


– Screw knurled screws -H- onto sealing flange -1-.

– When tightening, press sealing flange and sealing lip support ring -2- against surface of assembly tool - T10134- .

– This prevents locating pin from sliding out of hole in sender wheel.

– Ensure that sender wheel remains fixed on assembly tool when installing sealing flange.



Securing assembly tool - T10134- with sealing flange -1- on crankshaft flange:

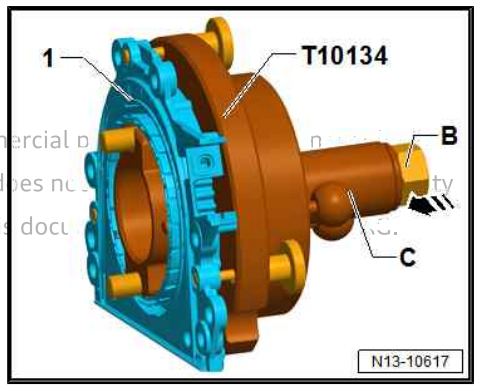
• Crankshaft flange must be free of oil and grease.

• Engine is at “TDC” position.

– Screw nut -B- to end of threaded spindle.

– Press threaded spindle of assembly tool - T10134- in direction of -arrow- until nut -B- makes contact with assembly housing -C-.

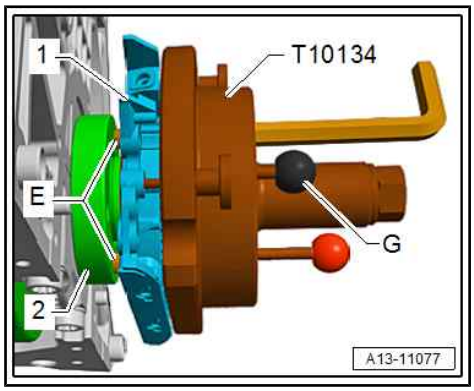
– Position flat edge of assembly housing towards sealing surface for sump on cylinder block.



– Secure assembly tool - T10134- with sealing flange -1- to crankshaft flange -2-.

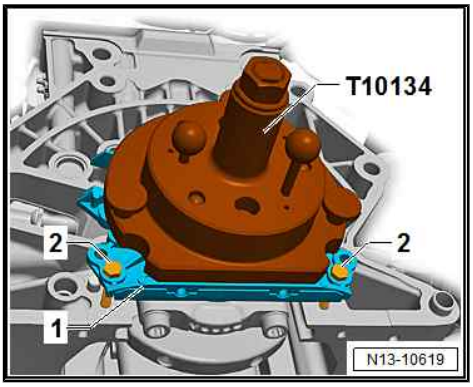
– To do so, screw hexagon socket head bolts -E- approx. 5 turns into crankshaft flange with hexagon key.

– Insert guide pin for diesel engines (black handle) -G- into crankshaft flange.



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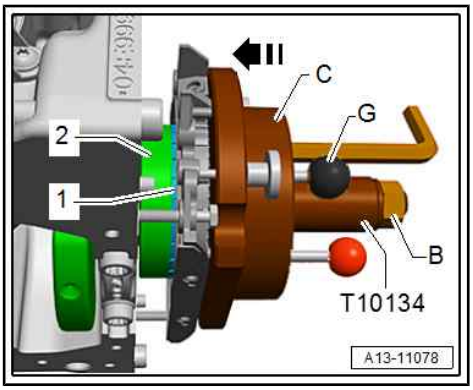
– Screw 2 bolts M6x35 -item 2- into cylinder block to guide sealing flange -1-.



Securing assembly tool - T10134- on crankshaft flange:

– Press assembly housing -C- by hand in direction of -arrow- until sealing lip support ring -1- touches surface of crankshaft flange -2-.

– Check that guide pin for diesel engines (black handle) -G- is fitted correctly in hole in crankshaft. This ensures that sender wheel reaches its final installation position.



Note

The guide pin for PETROL engines (red handle) MUST NOT be inserted into the threaded hole in the crankshaft.

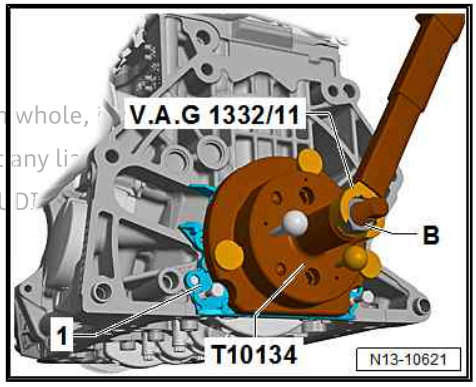
– Tighten the two hexagon socket head bolts on assembly tool hand-tight.

– Screw nut -B- onto threaded spindle by hand until it touches assembly housing -C-.

Pressing sender wheel onto crankshaft flange with assembly tool - T10134- :

– Tighten nut -B- on assembly tool - T10134- to 35 Nm.

• There must be a small gap between cylinder block and sealing flange -1- after nut has been tightened to 35 Nm.



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Checking installation position of sender wheel on crankshaft:

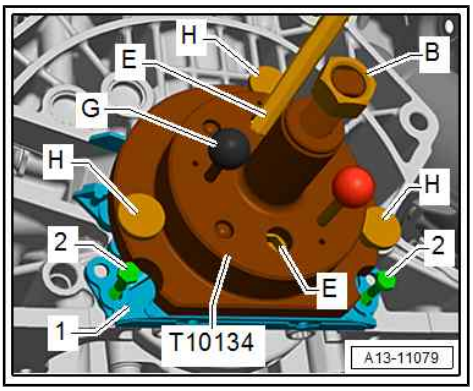
– Screw nut -B- to end of threaded spindle.

– Remove both bolts -2- from cylinder block.

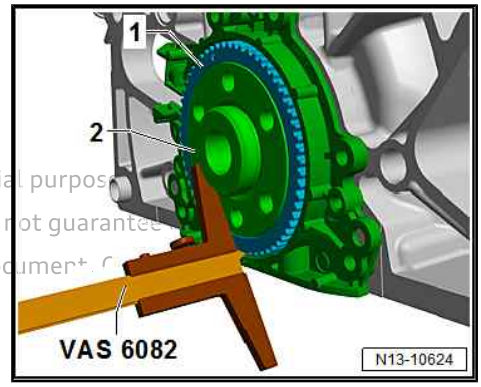
– Unscrew knurled screws -H- from sealing flange -1-.

– Unbolt assembly tool - T10134- from crankshaft flange (remove hexagon socket head bolts -E- from crankshaft flange).

– Detach sealing lip support ring.



– Apply depth gauge - VAS 6082- to crankshaft flange -2-.



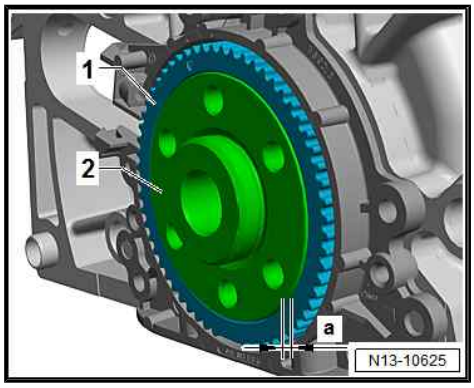
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– Measure distance -a- between crankshaft flange -2- and sender wheel -1-.

• Specification: Distance -a- = 0.5 mm.

– Press sender wheel in further if measurement is too small ⇒ page 84 .

– If reading matches specification, continue with assembly ⇒ page 85 .



Pressing sender wheel in further:

– Secure assembly tool - T10134- to crankshaft flange.

– Ensure that locating pin of assembly tool - T10134- is fitted in hole in sender wheel.

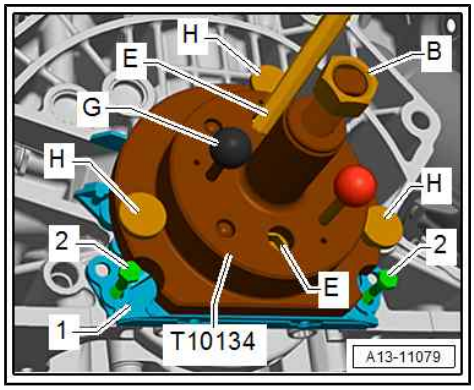
– Hand-tighten hexagon socket head bolts -E-.

– Slide assembly tool - T10134- onto sealing flange -1- by hand.

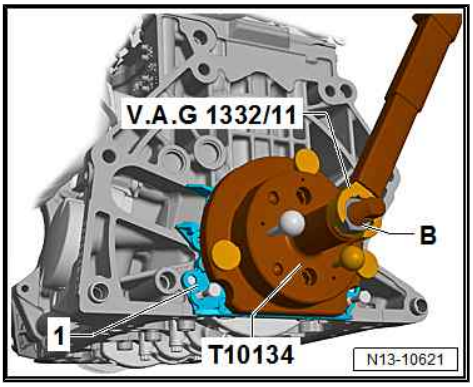
– Screw nut -B- onto threaded spindle by hand until it touches assembly tool - T10134- .

– Insert guide pin for diesel engines (black handle) -G- into crankshaft flange.

– Screw 2 bolts M6x35 -item 2- into cylinder block to guide sealing flange -1-.



– Tighten nut -B- on assembly tool - T10134- to 40 Nm.
– Check installation position of sender wheel on crankshaft again ⇒ page 83 .
– Tighten nut on assembly tool - T10134- to 45 Nm if measurement is too small.
– Check installation position of sender wheel on crankshaft again ⇒ page 83 .



Assembling:

Assembly is performed in reverse sequence; note the following:

– Install sump ⇒ page 165 .
– Install intermediate plate ⇒ page 77 .
– Install flywheel ⇒ page 77 .

Tightening torques

◆ ⇒ Fig. ""Sealing flange (gearbox end) - tightening torque and sequence"" , page 77

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3 Crankshaft

Overview

- ⇒ “3.1 Exploded view - crankshaft”, page 86
- ⇒ “3.2 Crankshaft dimensions”, page 87
- ⇒ “3.3 Measuring axial clearance of crankshaft”, page 87
- ⇒ “3.4 Measuring radial clearance of crankshaft”, page 88
- ⇒ “3.5 Extracting and driving in needle bearing for crankshaft”, page 88
- ⇒ “3.6 Pulling spur gear off crankshaft and shrink-fitting new spur gear”, page 90

Note

When performing assembly work, secure engine to engine and gearbox support ⇒ page 37 .

3.1 Exploded view - crankshaft

1 - Bearing shell
- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells

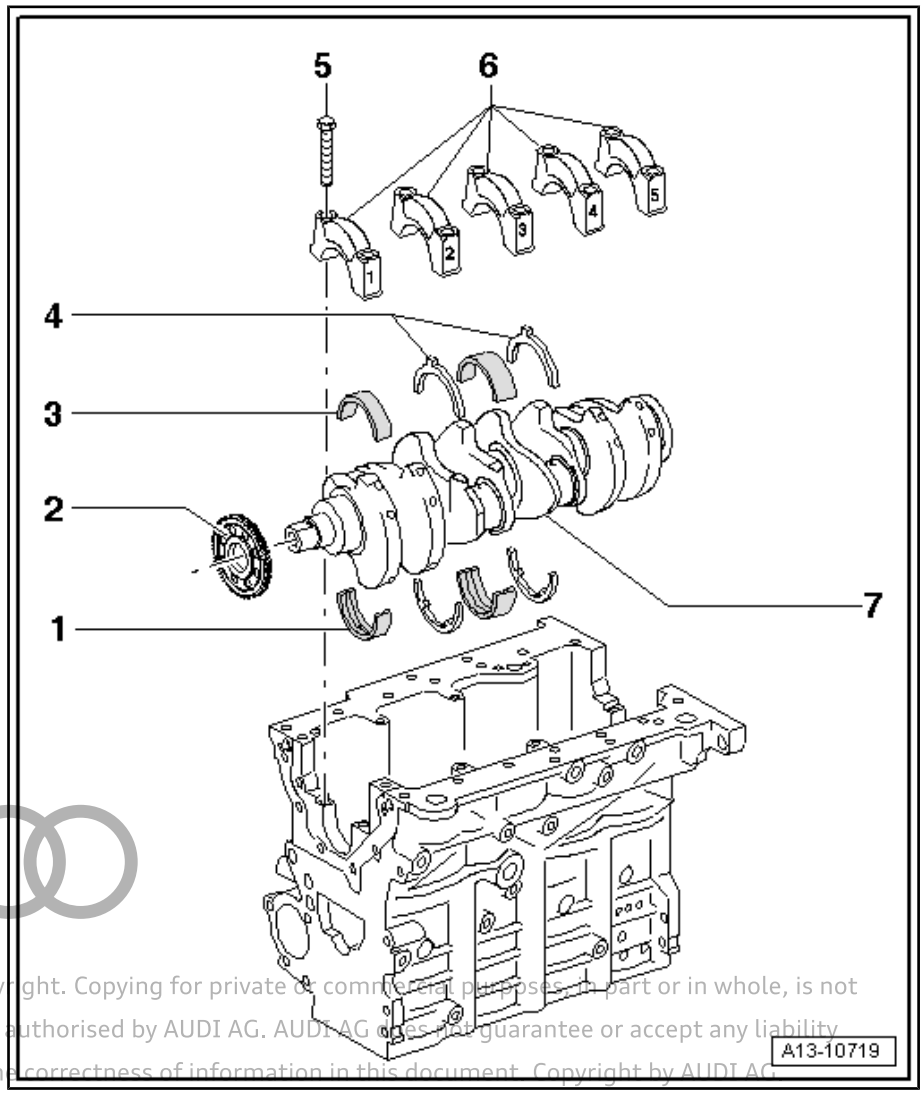
2 - Spur gear
- ❑ For balance shaft assembly
- ❑ Pulling spur gear off crankshaft and shrink-fitting new spur gear ⇒ page 90

3 - Bearing shell
- ❑ For bearing cap (without oil groove)
- ❑ Renew used bearing shells

4 - Thrust washers
- ❑ For bearing No. 3
- ❑ Different types for cylinder block and bearing cap
- ❑ Note location

5 - Bolts
- ❑ Renew
- ❑ 65 Nm +90°
- ❑ When measuring radial clearance, tighten used bolt to 65 Nm and turn 90° further

6 - Bearing caps
- ❑ Bearing cap 1: Pulley end



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- ❑ Bearing cap 3 with recesses for thrust washers
- ❑ Installation position: retaining lugs on bearing shells in cylinder block and bearing caps must be on the same side

7 - Crankshaft

- ❑ There should be no needle bearing fitted in the crankshaft on vehicles with manual gearbox; remove needle bearing if necessary ⇒ page 88
- ❑ Measuring axial clearance ⇒ page 87
- ❑ Measuring radial clearance ⇒ page 88
- ❑ Crankshaft dimensions ⇒ page 87

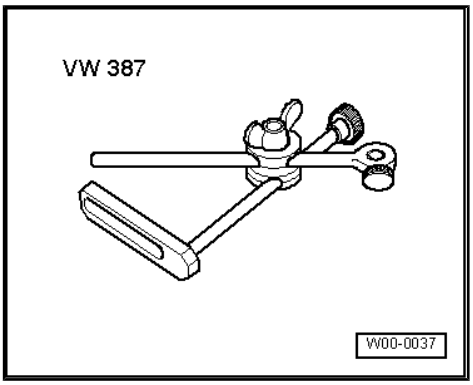
3.2 Crankshaft dimensions

Honing dimension	Main bearing journal ∅ mm	Conrod journal ∅ mm
Basic dimension	54.00 –0.022 -0.042	50.90 –0.022 -0.042

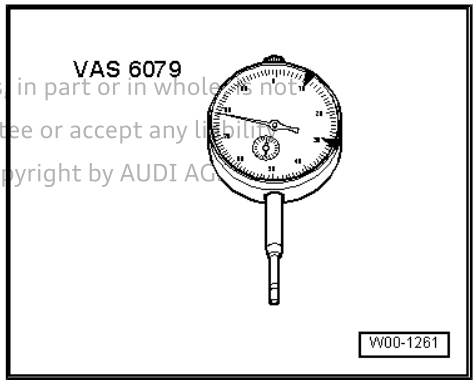
3.3 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

- ♦ Universal dial gauge bracket - VW 387-

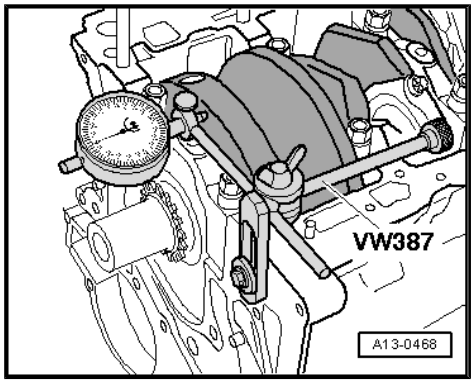


- ♦ Dial gauge - VAS 6079-



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Procedure



– Bolt dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- onto cylinder block (toothed belt end) as shown in illustration, and set it against crank web.
– Press crankshaft against dial gauge by hand.
– Set dial gauge to “0”.
– Push crankshaft away from dial gauge and read off value.

Axial clearance:

- New: 0.07 ... 0.17 mm
- Wear limit: 0.37 mm

3.4 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove bearing cap and clean bearing journal.
– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.

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- The Plastigauge must be positioned in the centre of the bearing shell.

– Fit bearing cap and secure with old bolts ⇒ Item 5 (page 86) without rotating crankshaft.
– Remove bearing cap again.
– Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.03 ... 0.08 mm.
- Wear limit: 0.17 mm.

3.5 Extracting and driving in needle bearing for crankshaft

Only fitted on vehicles with dual clutch gearbox

Note

♦ *A needle bearing must be fitted in the crankshaft on vehicles with dual clutch gearbox ⇒ Electronic parts catalogue .*

♦ *The needle bearing must always be renewed if the engine is separated from the gearbox.*

Special tools and workshop equipment required

♦ Pin - VW 207 C-

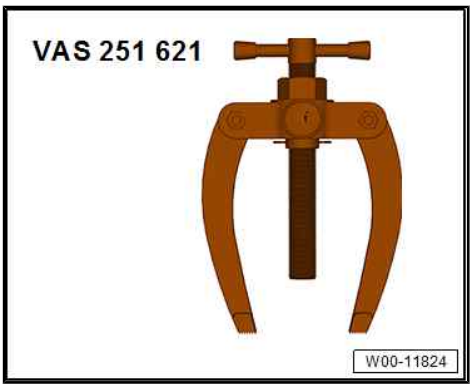


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♦ Internal puller - VAS 251 635-



♦ Counter-support - VAS 251 621-



Extracting needle bearing

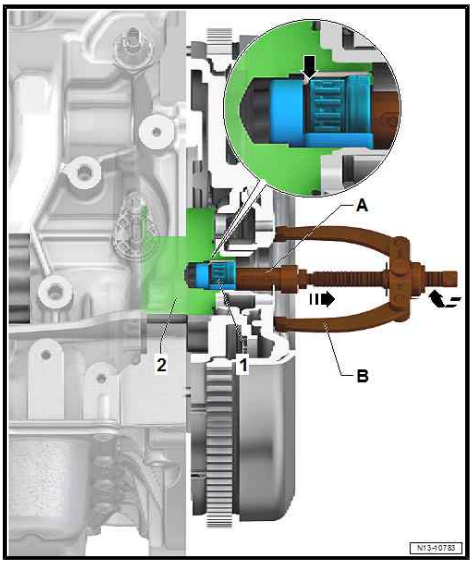
– Remove needle bearing -1- from crankshaft -2- using internal puller - VAS 251 635- -A- and counter-support - VAS 251 621- -B-.

– Internal puller must be positioned behind needle roller -arrow-.

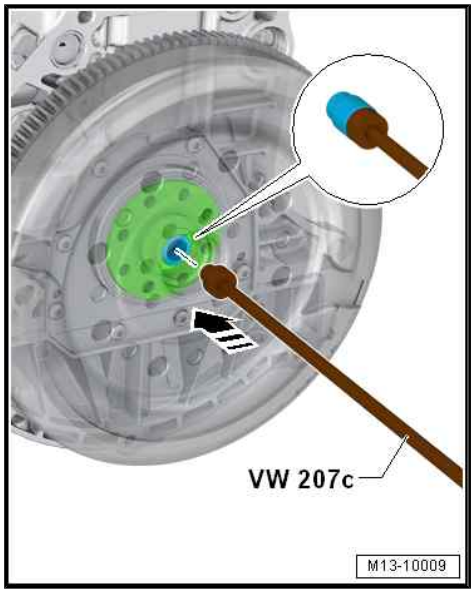
Installing

– The lettering on the needle bearing must be visible when installed.

– Clean bearing seat in crankshaft and grease lightly.



– Drive in with drift - VW 207 C- or centring mandrel - 3176- .



Installation depth: dimension -a- = 2.0 mm

Note:

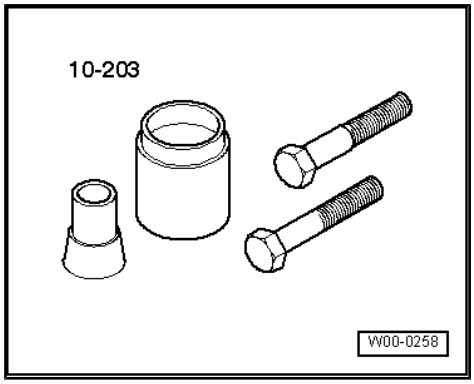
Renew needle bearing if you drive it in too far (needle bearing is damaged when it is pulled out again).



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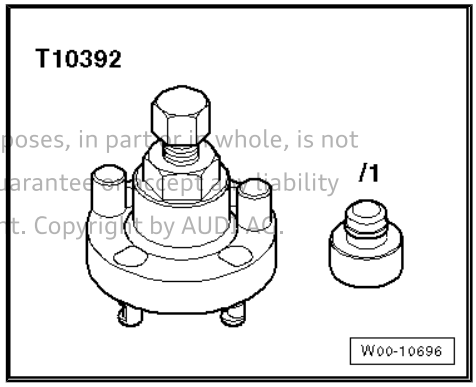
3.6 Pulling spur gear off crankshaft and shrink-fitting new spur gear

♦ Fitting tool - 10 - 203-

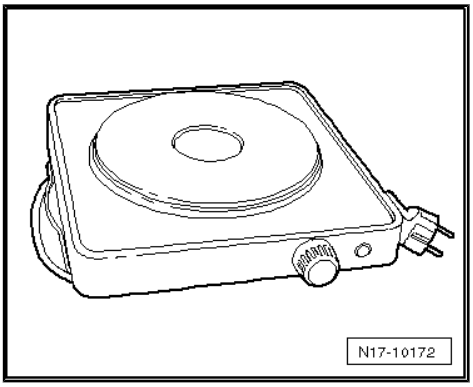


- Puller - T10392-

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- Temperature gauge - VAS 6519-
- Hotplate (commercially available)



- Protective gloves

Procedure

– Remove sealing flange (pulley end) ⇒ page 72 .

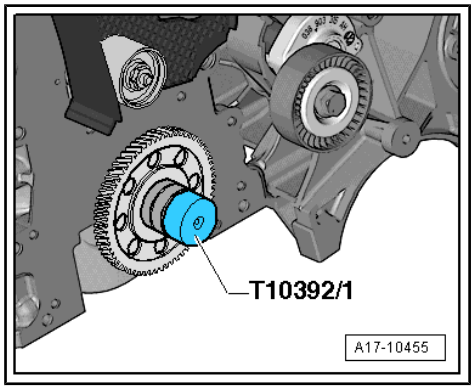
– Remove sump ⇒ page 165 .

Note

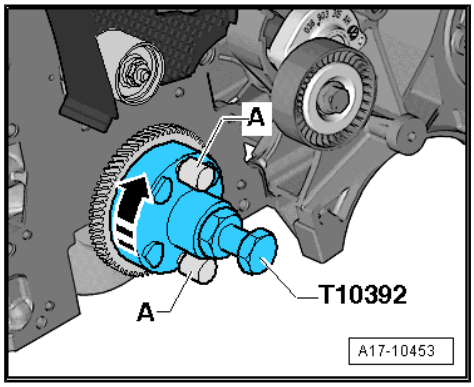
- *If the balance shaft assembly does not have to be renewed, it is sufficient just to remove the idler gear.*
- *If the bolt for the idler gear for the balance shaft assembly has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation*
  ⇒ "1.6 Installing a new balance shaft assembly", page 172 .

– Remove idler gear ⇒ Item 14 (page 161) for balance shaft assembly or remove balance shaft assembly ⇒ page 170 .

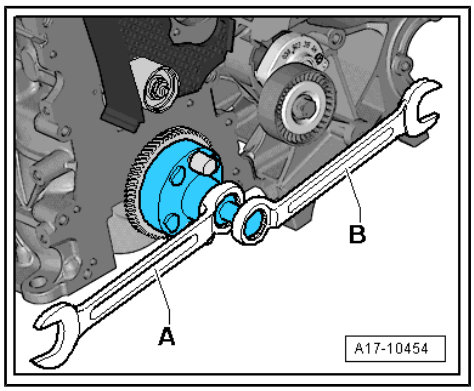
– Insert thrust piece -T10392/1- in end of crankshaft.



– Insert puller -T10392- in holes in spur gear, turn clockwise -arrow- and screw in locking pins -A-.



– Counterhold crankshaft with ring spanner -A- and pull spur gear off end of crankshaft by screwing in spindle with ring spanner -B-.



Note

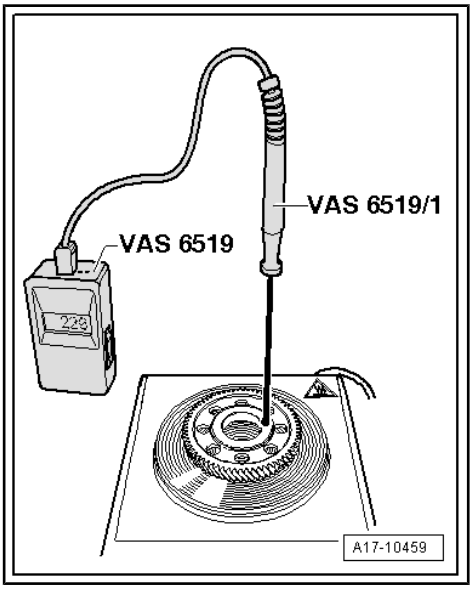
- *While heating up the new spur gear, monitor the temperature with the temperature gauge - VAS 6519- .*
- *When the temperature reaches 200 °C, you have approx. 4 seconds to fit the spur gear on the crankshaft.*
- *A higher temperature increases the amount of time available (220 °C = approx. 6 seconds).*
- *Make sure the end of the crankshaft is clean.*

Caution

Do not exceed a maximum temperature of 240 °C; otherwise the spur gear can become discoloured and distorted.

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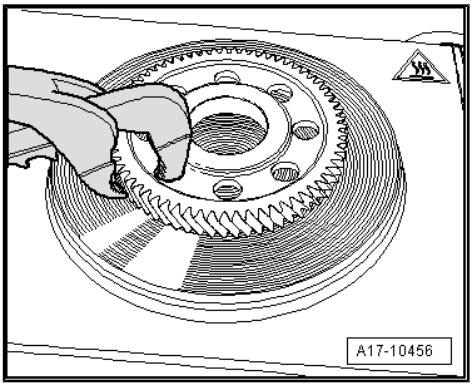
– Place the new spur gear flat on a commercially available hot-plate and heat it up to at least 200 °C, but not more than 240 ° C. Lettering faces upwards.
– Set temperature gauge - VAS 6519- to measuring range 2.
– Position temperature sensor -VAS 6519/1- on collar of spur gear (as shown) and read off temperature at temperature gauge.



WARNING

Risk of burns. Use suitable protective gloves for the following steps.

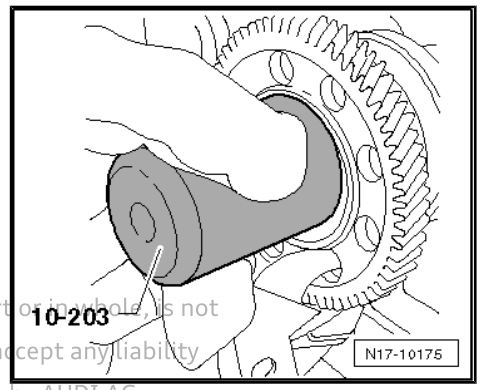
– When the required temperature has been reached, pick up the spur gear with pliers as illustrated.



Note

Take care not to damage the teeth of the spur gear.

– With the aid of fitting tool - 10 - 203- , slide spur gear by hand onto end of crankshaft as far as stop. This must be done without delay, taking care to keep the gear straight.
– Wait a few minutes to allow the spur gear to cool down.
– Install balance shaft assembly
⇒ “1.6 Installing a new balance shaft assembly”, page 172 .



Or

– Install idler gear for balance shaft assembly
⇒ “1.6 Installing a new balance shaft assembly”, page 172 .
– Install sealing flange (pulley end) ⇒ page 72 .

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4 Pistons and conrods

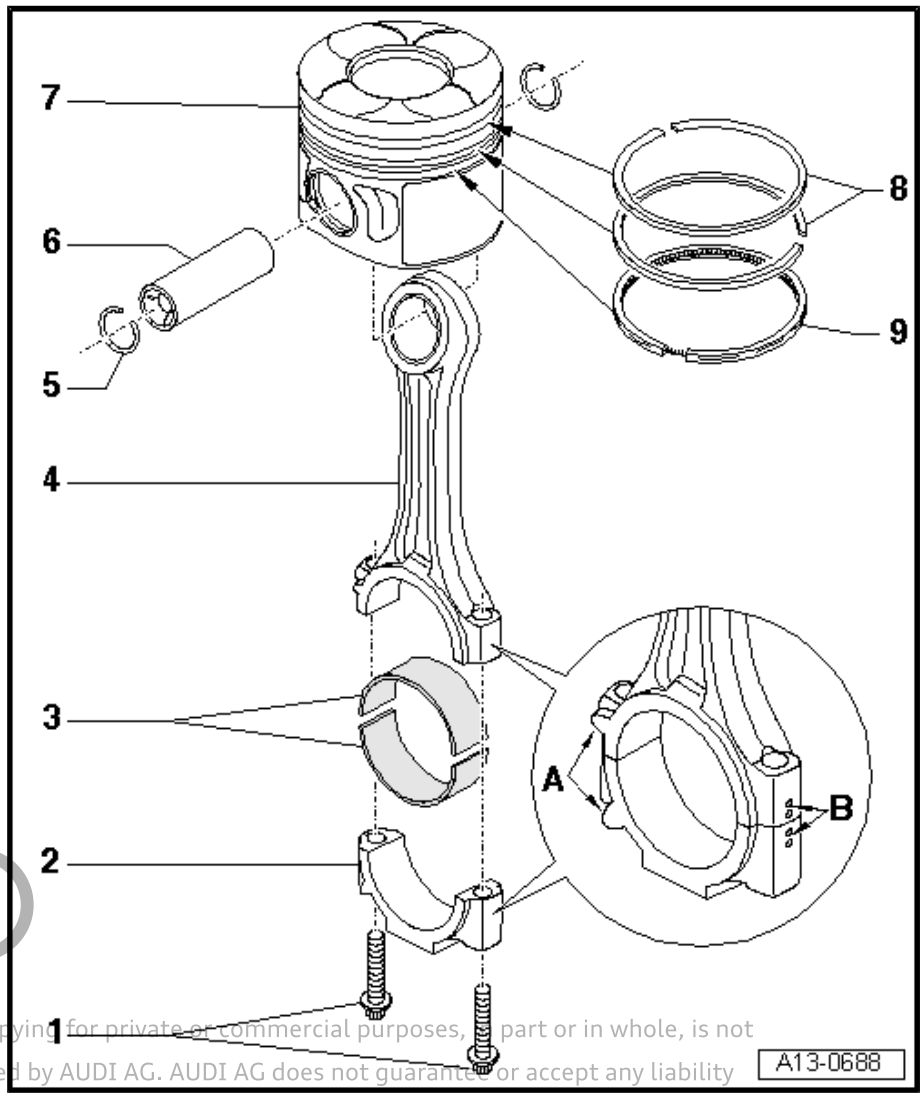
Overview

- ⇒ “4.1 Exploded view - pistons and conrods”, page 94
- ⇒ “4.2 Measuring piston projection at TDC ”, page 98
- ⇒ “4.3 Piston and cylinder dimensions”, page 99
- ⇒ “4.4 Measuring radial clearance of conrods”, page 99

Note

Oil spray jet and pressure relief valve ⇒ page 97

4.1 Exploded view - pistons and conrods



1 - Bolt

- ❑ Renew
- ❑ When measuring radial clearance, tighten used bolt to 30 Nm and turn 90° further
- ❑ Lubricate threads and contact surface
- ❑ 30 Nm +90°

2 - Conrod bearing cap

- ❑ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- ❑ Mark cylinder allocation in colour -B-
- ❑ Installation position: Markings -A- face towards pulley end

3 - Bearing shell

- ❑ Installation position ⇒ page 97
- ❑ Renew used bearing shells
- ❑ Note version: Upper bearing shell (closest to piston) is constructed from a more wear-resistant material; refer to ⇒ Electronic parts catalogue
- ❑ Check that it is securely seated

4 - Conrod

- ❑ Only renew as a complete set
- ❑ With industrially cracked conrod bearing cap
- ❑ Separating parts of new conrod ⇒ page 97

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- ❑ Mark cylinder allocation in colour -B-
- ❑ Installation position: Markings -A- face towards pulley end
- ❑ Axial clearance: wear limit: 0.37 mm
- ❑ Measuring radial clearance ⇒ page 99

5 - Circlip

- ❑ Renew

6 - Piston pin

- ❑ If difficult to move, heat piston to approx. 60 °C
- ❑ Remove and install using drift - VW 222 A-

7 - Piston

- ❑ With combustion chamber
- ❑ Version fitted in vehicle may differ from illustration
- ❑ Mark installation position and cylinder number ⇒ page 96
- ❑ Checking ⇒ page 96
- ❑ Install using piston ring clamp
- ❑ Piston and cylinder dimensions ⇒ page 99
- ❑ Measuring cylinder bore ⇒ page 96
- ❑ Measuring piston projection at “TDC” ⇒ page 98

8 - Piston rings

- ❑ Compression rings
- ❑ Offset gaps by 120°
- ❑ Use piston ring pliers to remove and install
- ❑ Installation position: marking “TOP” or side with lettering faces towards piston crown
- ❑ Measuring ring gap ⇒ page 95
- ❑ Measuring ring-to-groove clearance ⇒ page 96

9 - Piston ring

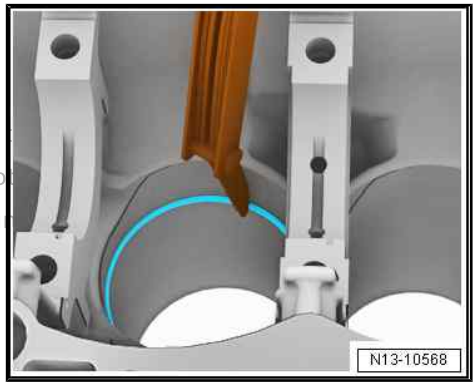
- ❑ Oil scraper ring
- ❑ Offset gap 120° from bottom compression ring
- ❑ Use piston ring pliers to remove and install
- ❑ Measuring ring gap ⇒ page 95
- ❑ Measuring ring-to-groove clearance ⇒ page 96

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Measuring piston ring gap

– Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder.

– To do so, use a piston without rings.



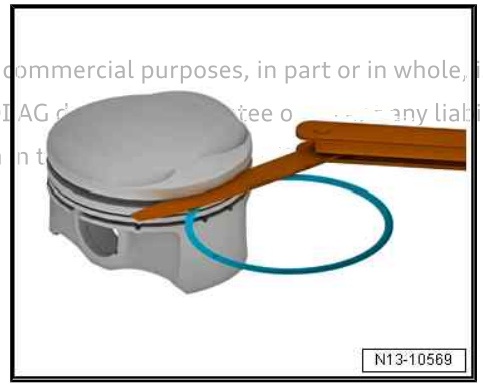
Piston ring	new mm	Wear limit mm
1st compression ring	0.25 … 0.40	1.00
2nd compression ring	0.25 … 0.40	1.00
Oil scraper ring	0.25 … 0.50	1.00

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Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.

Piston ring	new mm	Wear limit mm
1st compression ring	0.06 … 0.09	0.25
2nd compression ring	0.05 … 0.08	0.25
Oil scraper ring	0.03 … 0.06	0.15

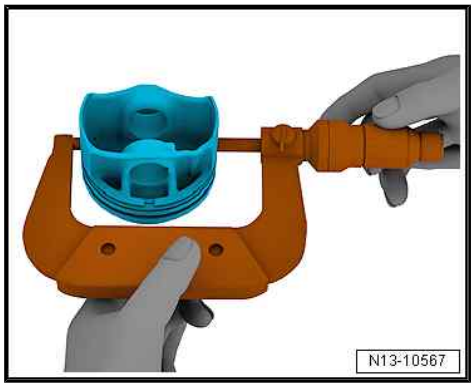


Checking piston

– Using a micrometer (75 ... 100 mm), measure approx. 15 mm from the lower edge, perpendicular to the piston pin axis.

• Maximum deviation from nominal dimension: 0.04 mm.

Nominal dimension
⇒ “4.3 Piston and cylinder dimensions”, page 99 .

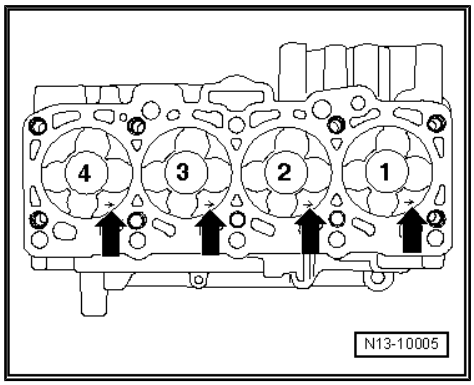


Note

Renew piston if cracking is visible on piston skirt.

Installation position of pistons and allocation of piston/cylinder

• Arrow on piston crown points to pulley end -arrows-.

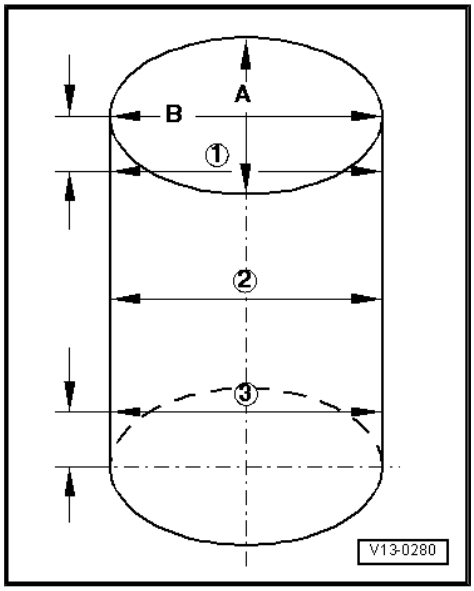


Measuring cylinder bore

– Use a cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.

• Maximum deviation from nominal dimension: 0.10 mm.

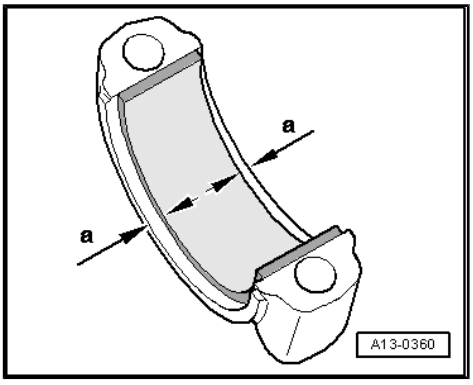
Nominal dimension
⇒ “4.3 Piston and cylinder dimensions”, page 99 .



Installation position of bearing shells in conrods

– Insert bearing shells centrally in conrod and conrod bearing cap.

• Dimension -a- = 2.5 mm



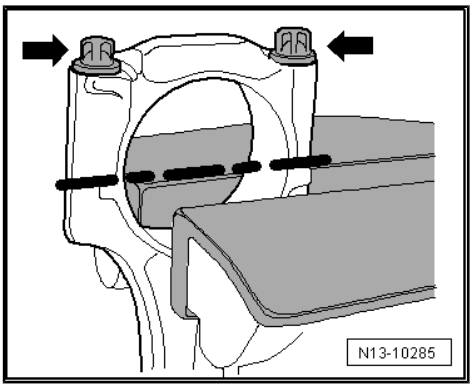
Separating parts of new conrod

It is possible that the two parts of a new conrod are not completely separated as intended. If it is not possible to take off the conrod bearing cap by hand, proceed as follows:

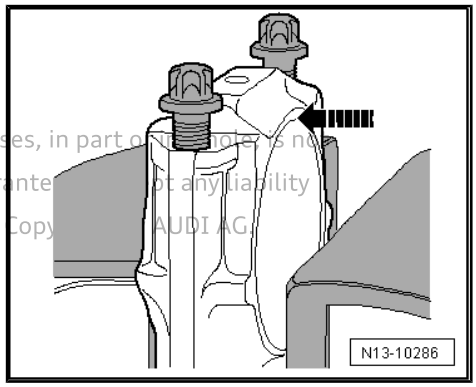
– To avoid any risk of damage, the conrod should only be clamped lightly in a vice using jaw covers as shown in illustration.

• The conrod is clamped in position below the dotted line.

– Unscrew bolts -arrows- approx. 5 turns.



– Using a plastic hammer, carefully knock conrod bearing cap loose -arrow-.



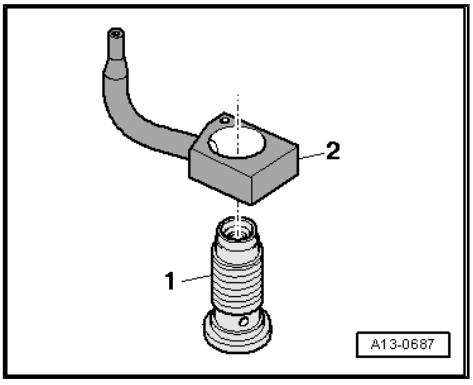
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Oil spray jet and pressure relief valve

1 - Bolt with pressure relief valve, 27 Nm

2 - Oil spray jet (for cooling of pistons)

• Installation position: align locating edge of oil spray jet with machined surface of cylinder block.



Note

♦ *Take care not to bend oil spray jets.*

♦ *Always renew bent oil spray jets.*

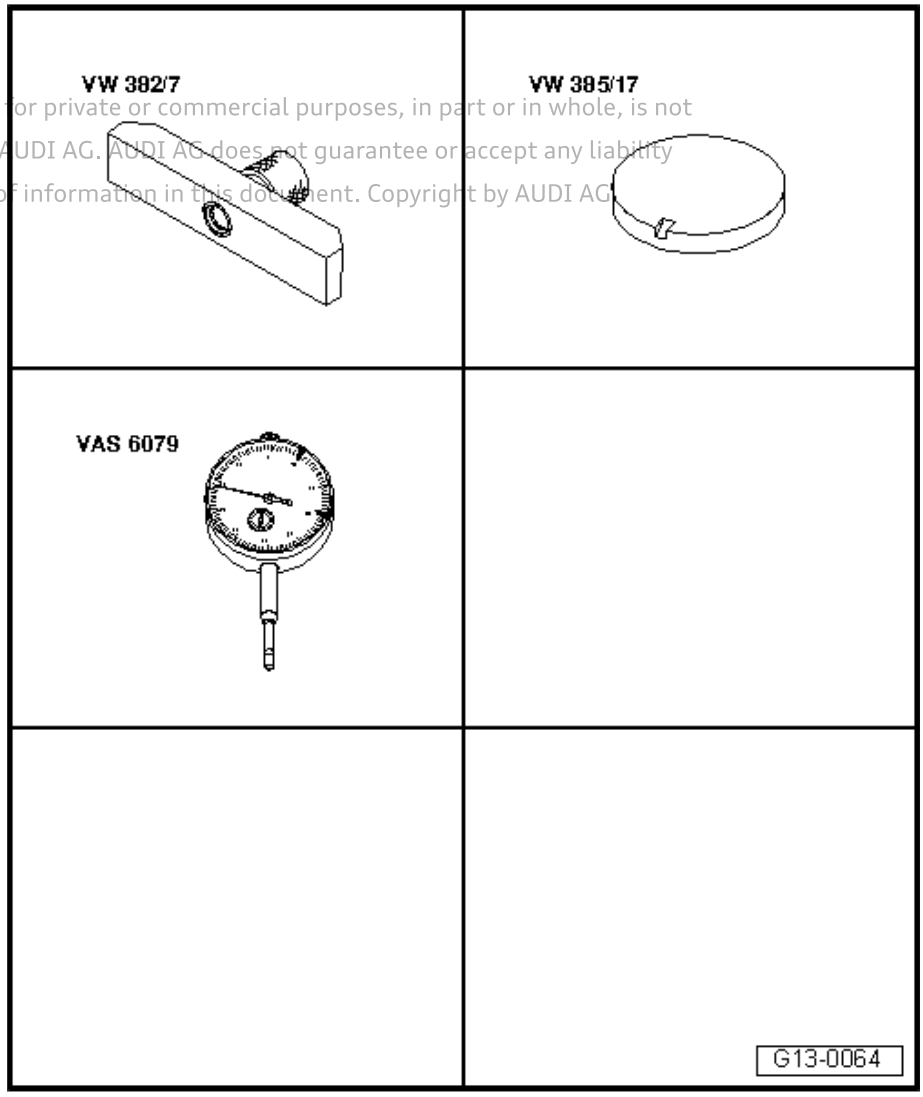
4.2 Measuring piston projection at “TDC”

Note

- *Piston projection at “TDC” must be measured when installing new pistons or a short engine.*
- *If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct cylinder head gasket size.*
- *Depending upon piston projection, install the corresponding cylinder head gasket according to the table below.*

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Special tools and workshop equipment required



- Measuring bridge -VW 382/7- from measuring tool - VW 382-
- Measuring plate -VW 385/17- from universal measuring tool - VW 385-
- Dial gauge - VAS 6079-

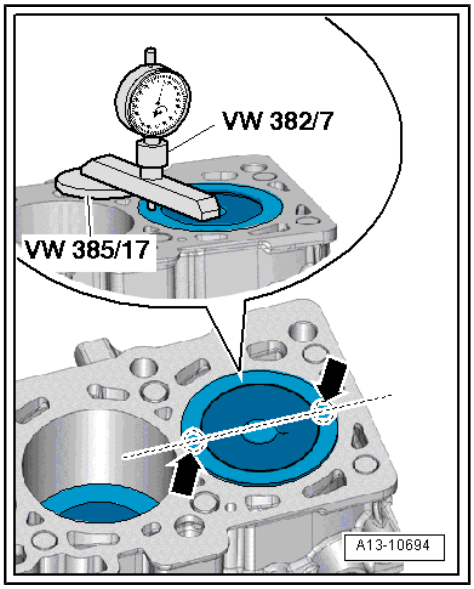
Procedure

– Secure dial gauge - VAS 6079- with measuring bridge - VW 382/7- and measuring plate -VW 385/17- to cylinder block as shown in illustration.

– Measure projection at each piston at both locations marked with -arrows- (seen in longitudinal direction of engine: at front and rear of piston).

– Depending on piston projection, install corresponding cylinder head gasket according to following table:

Piston projection above top surface of cylinder block mm	Identification (no. of holes)
0.91 … 1.00	1
1.01 … 1.10	2
1.11 … 1.20	3



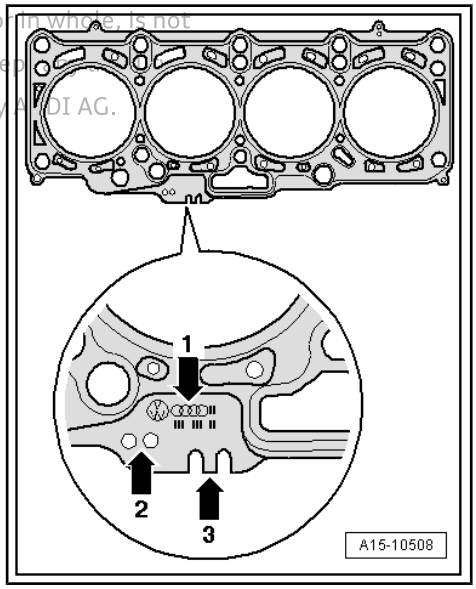
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Identification of cylinder head gasket

1 - Part number

2 - Holes

3 - Ignore



Note

If the measured values for piston projection are not the same for all pistons, use the highest value to determine the correct cylinder head gasket size.

4.3 Piston and cylinder dimensions

Honing dimension	Piston ∅ mm	Cylinder bore ∅ mm
Basic dimension	80.96[1)]	81.01
• [1)] Dimensions including coating (thickness 0.02 mm). The coating will wear down in service.		

4.4 Measuring radial clearance of conrods

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove conrod bearing cap. Clean bearing cap and bearing journal.

– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.

– Fit conrod bearing cap and secure with old bolts ⇒ Item 1 (page 94) without rotating crankshaft.
– Remove conrod bearing cap again.
– Compare width of Plastigauge with measurement scale.

Radial clearance:

• Wear limit: 0.08 mm.

– Renew conrod bolts.

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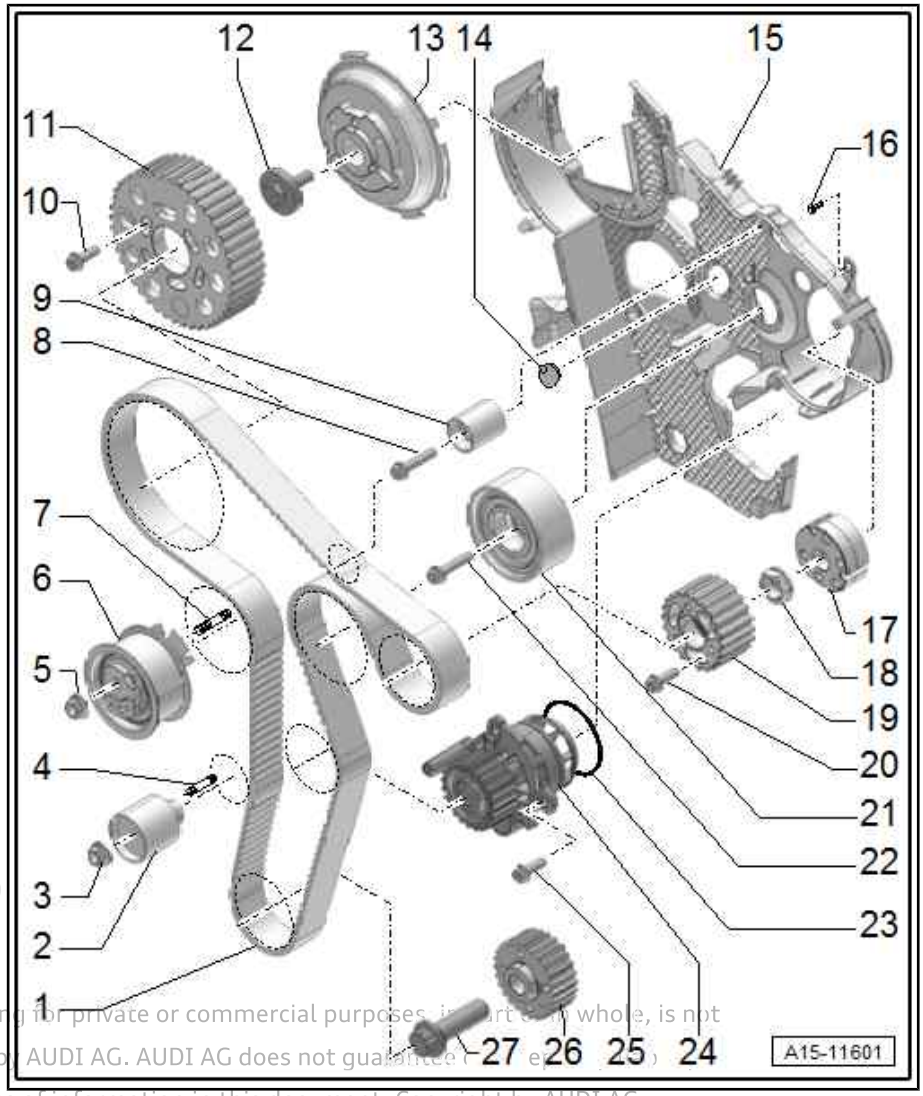
15 – Cylinder head, valve gear

1 Toothed belt drive

Overview

- ⇒ “1.1 Exploded view - toothed belt”, page 101
- ⇒ “1.2 Removing and installing toothed belt”, page 103

1.1 Exploded view - toothed belt



1 - Toothed belt

- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Check for wear
- ❑ Removing ⇒ page 103
- ❑ Installing (adjusting valve timing) ⇒ page 110

2 - Idler roller

3 - Nut

- ❑ Make sure that stud is fitted securely
- ❑ 20 Nm

4 - Stud

- ❑ 15 Nm

5 - Nut

- ❑ Renew nut
- ❑ Make sure that stud is fitted securely
- ❑ 20 Nm +45°

6 - Tensioning roller

- ❑ Before renewing, toothed belt and engine support must be removed

7 - Stud

- ❑ 15 Nm

8 - Bolt

- ❑ 20 Nm

9 - Idler roller

10 - Bolt

- ❑ Renew
- ❑ 20 Nm +45°

11 - Camshaft sprocket

12 - Bolt

- ❑ Slacken and tighten with counterhold tool - T10051-
- ❑ 100 Nm

13 - Camshaft hub

- ❑ Removing and installing ⇒ “3.5 Removing and installing camshafts”, page 145

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14 - Plug

15 - Toothed belt cover (rear)

16 - Bolt

- ❑ 9 Nm

17 - High-pressure pump hub

- ❑ Removing and installing ⇒ Rep. gr. 23

18 - Nut

- ❑ Tightening torque ⇒ Rep. gr. 23

19 - High-pressure pump sprocket

20 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

21 - Idler roller

22 - Bolt

- ❑ Renew
- ❑ 50 Nm +90°

23 - O-ring

- ❑ Renew

24 - Coolant pump

- ❑ Removing and installing ⇒ page 207

25 - Bolt

- ❑ Tightening torque ⇒ Item 1 (page 206)

26 - Crankshaft sprocket

- ❑ Contact surface between sprocket and crankshaft must be free of oil
- ❑ Can only be installed in one position

27 - Bolt

- ❑ Renew
- ❑ Slacken and tighten with counterhold tool - 3415-
- ❑ Do not additionally oil threads and shoulder

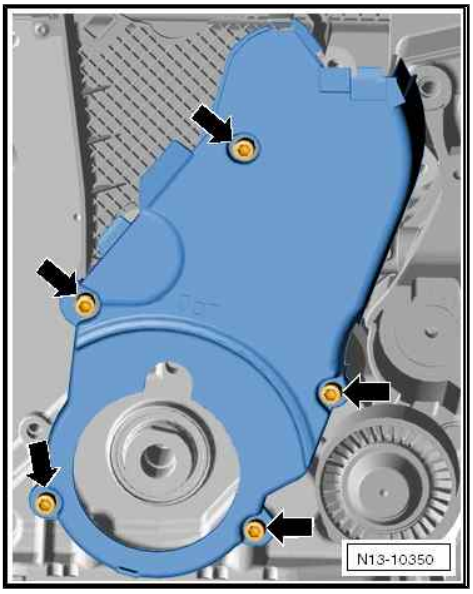
Tighten in three stages as follows:

- ♦ 1st stage: 180 Nm
- ♦ 2nd stage: Use rigid wrench to turn 90° further
- ♦ 3rd stage: Use rigid wrench to turn 45° further

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Toothed belt cover (bottom and centre) - tightening torque

– Tighten bolts -arrows- to 9 Nm.



Different tensioning roller versions

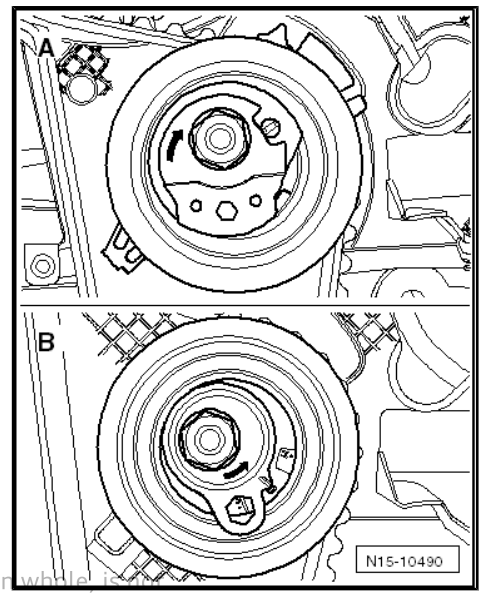
Depending on version, two different types of tensioning roller may have been installed. It is possible to switch between them. When making adjustments, check which type of tensioning roller is installed.

Tensioning roller version -A-:

- Use locking tool - T10265- for installation.
- Make sure tensioning roller is positioned correctly in toothed belt cover.
- To tension toothed belt, turn eccentric adjuster clockwise -arrow-.

Tensioning roller version -B-:

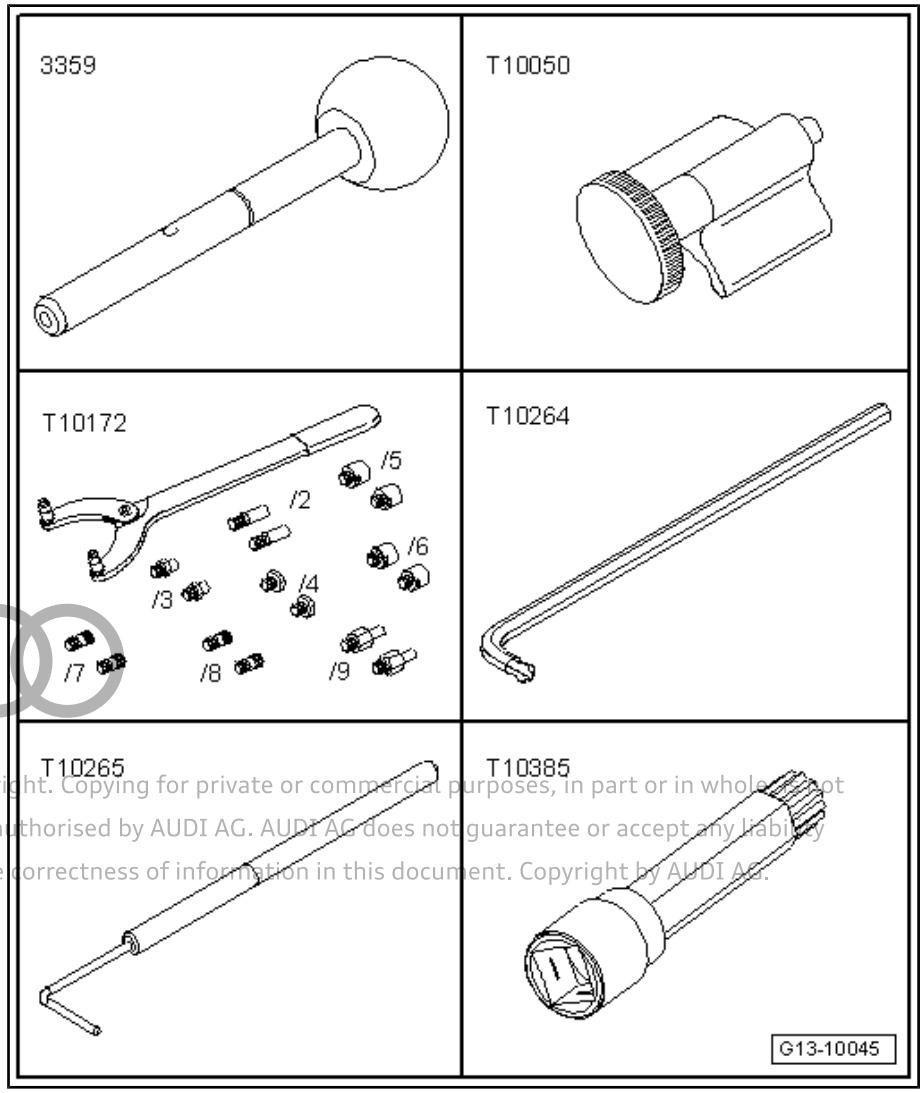
- No locking tool is necessary for installation.
- The tensioning roller is not located in the toothed belt cover.
- To tension toothed belt, turn eccentric adjuster anticlockwise -arrow-.



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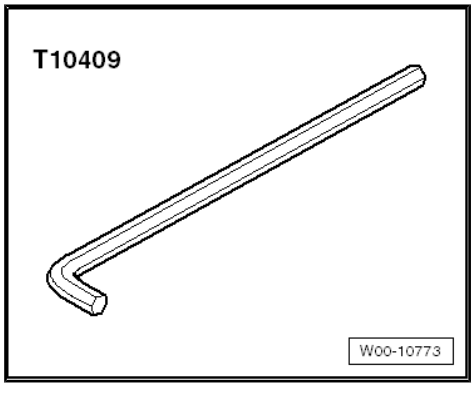
1.2 Removing and installing toothed belt

Special tools and workshop equipment required



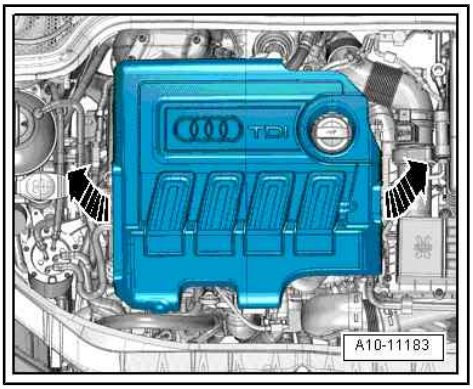
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- 2x diesel injection pump locking pin - 3359-
- Crankshaft stop - T10050- or crankshaft stop - T10100-
- Counterhold tool - T10172-
- Offset screwdriver - T10264- for vehicles with tensioning roller version -A- ⇒ page 103
- Locking tool - T10265-
- Bit XZN 10 - T10385-
- Offset screwdriver, 8 mm - T10409- for vehicles with tensioning roller version -B- ⇒ page 103

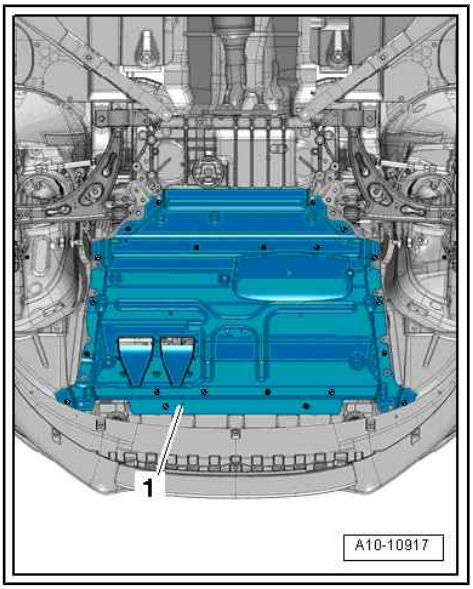


Removing

– Remove engine cover panel -arrows-.



– Remove front right wheel.
– Remove noise insulation -1- ⇒ Rep. gr. 50 .

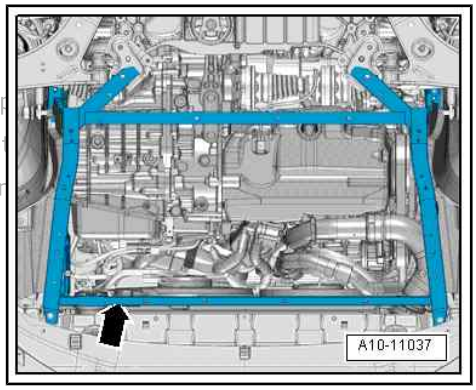


– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .

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Note

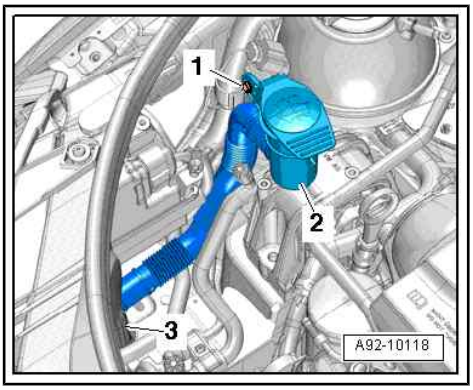
The engine support must be removed if you also need to renew the tensioning roller.



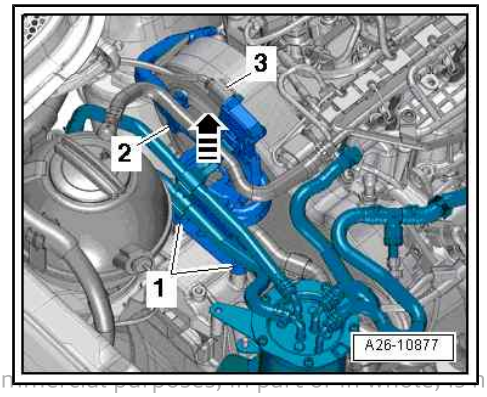
– Remove bolt -1-.
– Push filler pipe with filler neck -2- for washer fluid reservoir to side.

Note

For illustration purposes, the installation position is shown with the fuel filter removed.

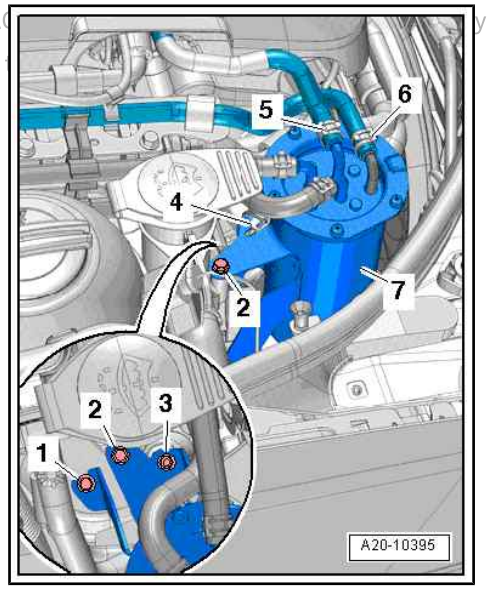


– Move clear air hoses at bracket -2-.
– Pull off bracket for fuel hoses upwards -arrow- and press clear to one side.
– Unplug electrical connector -3-.
– Remove bolts -1- and move pressure differential sender - G505- with bracket clear to one side.

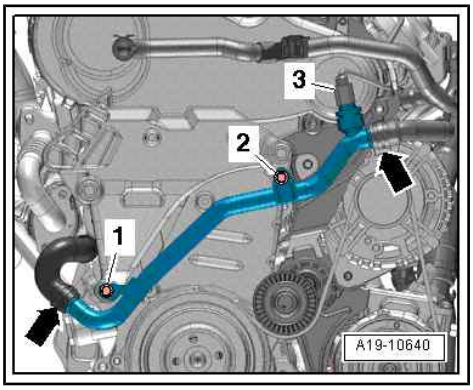


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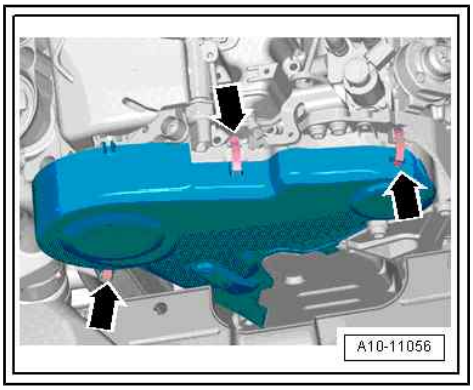
– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach hose retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



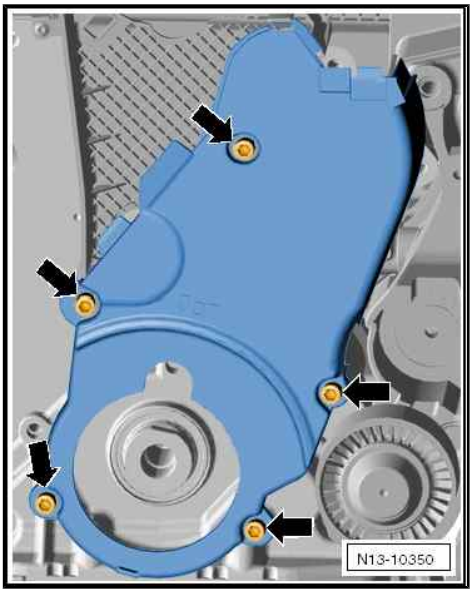
– Unplug electrical connector -3- at radiator outlet coolant temperature sender - G83- .
– Remove nut -1- and bolt -2-.
– Move coolant pipe (right-side) -arrows- to side (coolant hoses remain connected).



– Release retaining clips -arrows- and detach toothed belt cover (top).
– Remove vibration damper ⇒ page 65 .



– Remove bolts -arrows-.
– Detach toothed belt cover (bottom and centre).

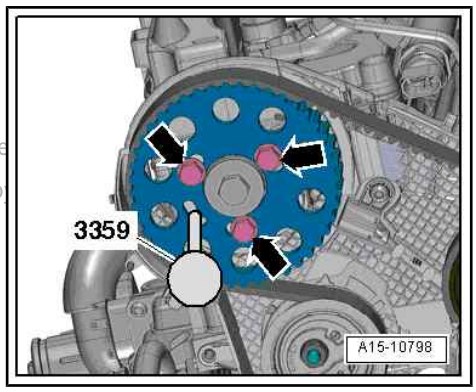


Caution

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Irreparable damage can be caused if the toothed belt slips.

- ***Only turn crankshaft in direction of engine rotation.***



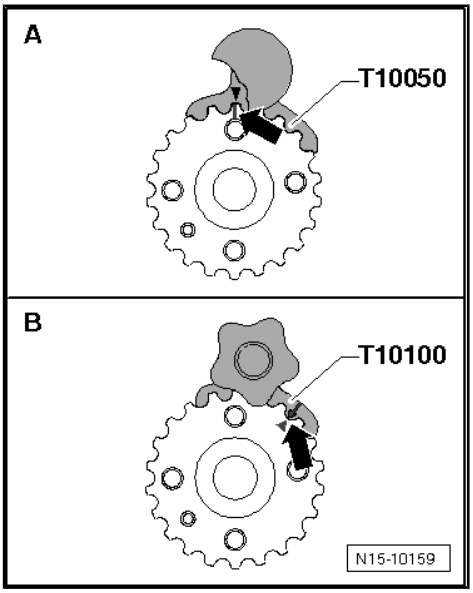
– Rotate crankshaft by turning bolt on crankshaft sprocket until camshaft sprocket is positioned at “TDC”.
– Lock camshaft hub with diesel injection pump locking pin -3359- .

Note

Disregard -arrows-.

– Lock crankshaft sprocket using crankshaft stop - T10050- for engines with circular crankshaft sprocket, or crankshaft stop - T10100- for engines with oval crankshaft sprocket.

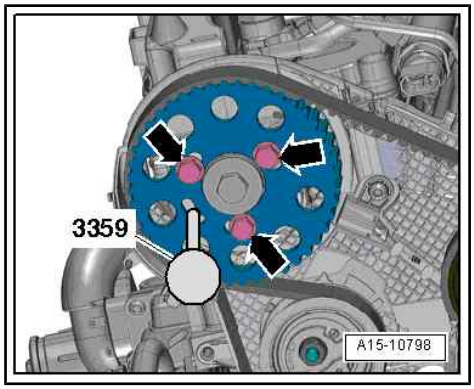
- The markings on the toothed belt sprocket and the crankshaft stop must align -arrow-. The pin of the crankshaft stop must engage in the aperture in the sealing flange.



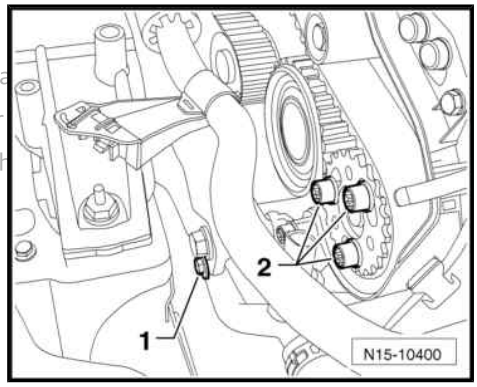
Note

The crankshaft stop can only be pushed onto the sprocket from the front face of the teeth.

– Slacken bolts -arrows- for camshaft sprocket approx. 90°.



– Using bit XZN 10 - T10385- , loosen bolts -2- for high-pressure pump sprocket approx. 90°.

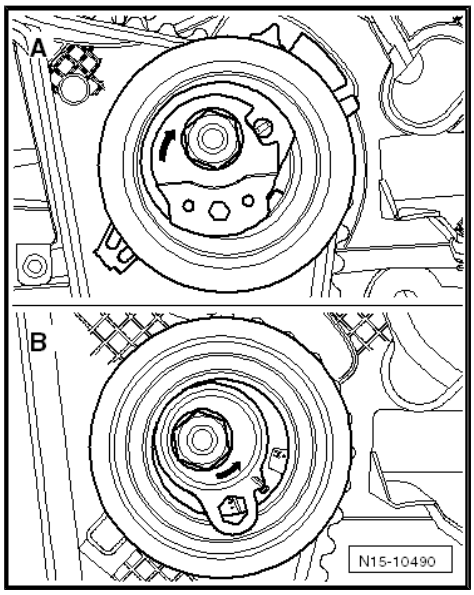


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Note

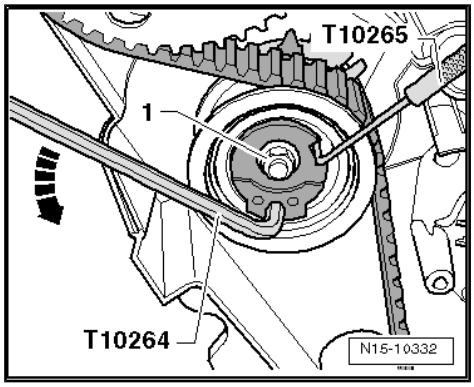
Disregard -item 1-.

Vehicles with tensioning roller version “A”:

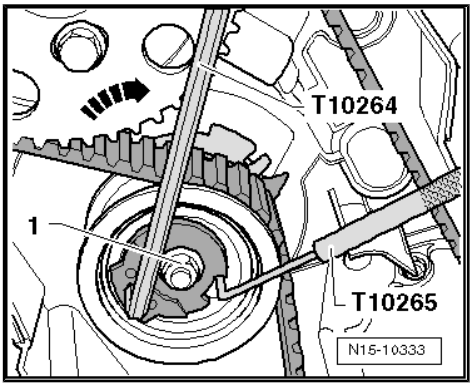


– Slacken nut -1- for tensioning roller.

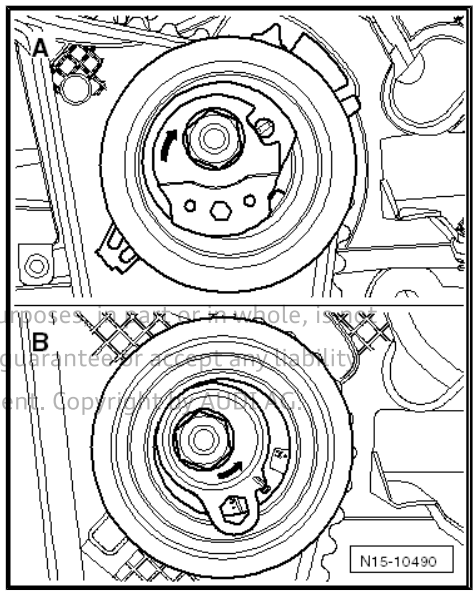
– Turn eccentric adjuster of tensioning roller with offset screwdriver - T10264- anti-clockwise -arrow- until tensioning roller can be secured with locking tool - T10265- .



– Then use offset screwdriver - T10264- to turn eccentric adjuster of tensioning roller clockwise -arrow- as far as stop and tighten nut -1- by hand.



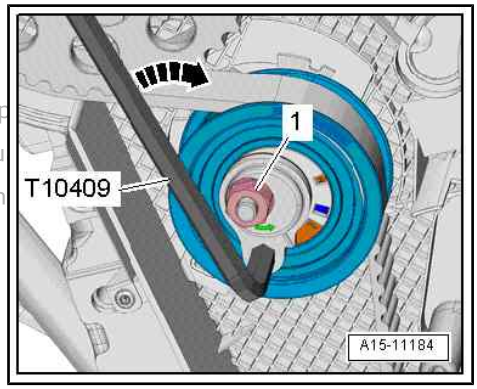
Vehicles with tensioning roller version “B”:



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– Slacken nut -1- for tensioning roller.
– Turn eccentric adjuster of tensioning roller with offset screwdriver, 8 mm - T10409- clockwise -arrow- until tensioning roller is slackened.
– Tighten nut for tensioning roller hand-tight again.



All vehicles (continued):

Caution

If a used belt runs in the opposite direction when it is refitted, this can cause breakage.

- ***Before removing, mark direction of rotation of toothed belt with chalk or felt-tip pen for re-installation.***

– Take off toothed belt first from idler roller and then from remaining sprockets.

Installing (adjusting valve timing)

Tightening torque

- ⇒ “1.1 Exploded view - toothed belt”, page 101

Note

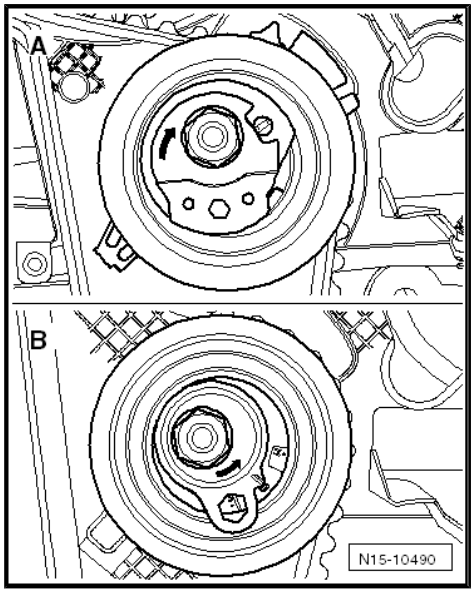
Perform adjustments on toothed belt only when engine is cold.

Caution

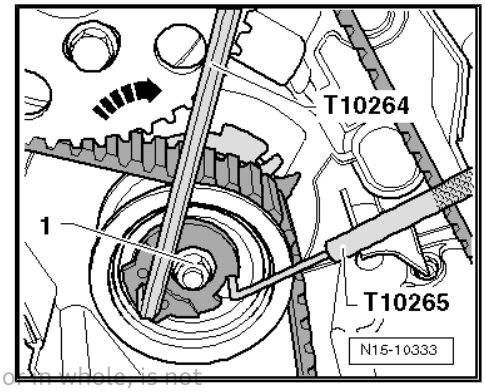
Risk of damage to valves and piston crowns.

- ***The crankshaft must not be at “TDC” at any cylinder when the camshaft is turned.***

Vehicles with tensioning roller version -A-:

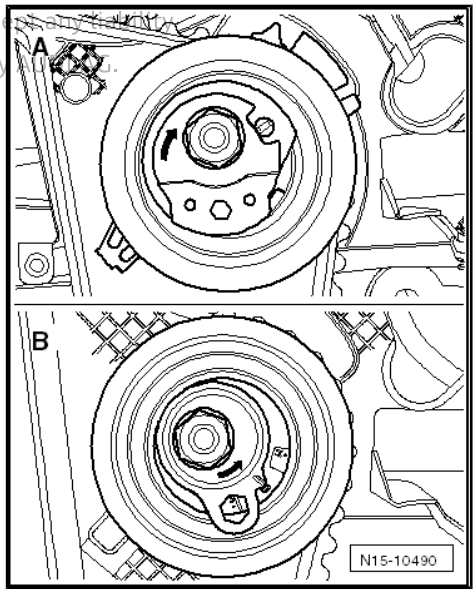


- Tensioning roller is locked with locking tool - T10265- and secured at right stop with nut.

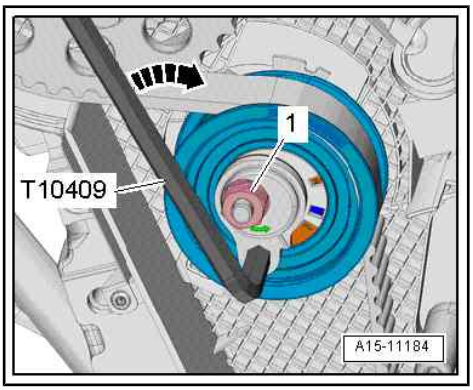


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Vehicles with tensioning roller version -B-:

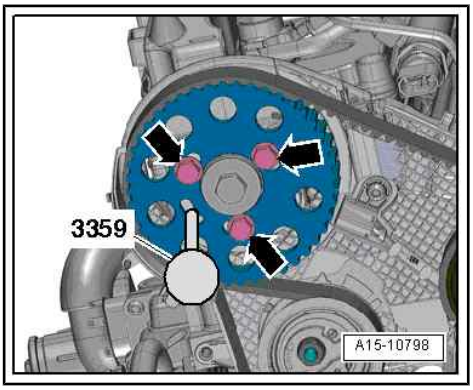


- Tensioning roller slackened and nut -1- tightened to approx 3 Nm.

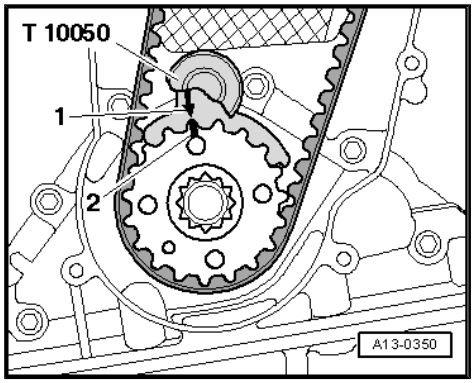


All vehicles (continued):

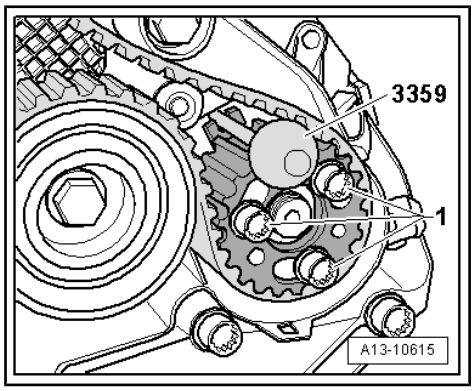
- Camshaft hub locked with diesel injection pump locking pin - 3359- .
- Bolts -arrows- are fitted but not tightened.
- It should just be possible to turn the sprocket on the camshaft without axial movement.



- Crankshaft is locked in position with crankshaft stop - T10050- .

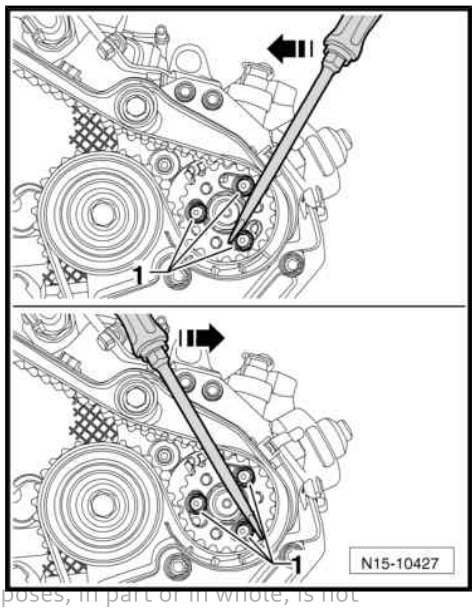


- Hub of high-pressure pump locked with diesel injection pump locking pin - 3359- .
- Bolts -1- are fitted but not tightened.
- The high-pressure pump sprocket should still just turn, but there must be no axial movement.



Note

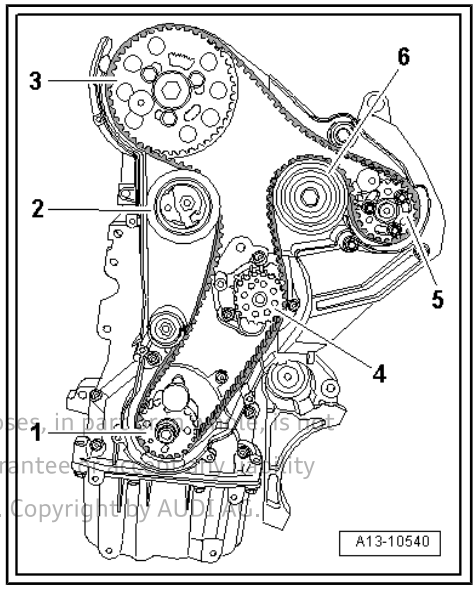
If necessary, apply a screwdriver to bolt heads -1- and turn the high-pressure pump hub until it can be locked with the locking pin.



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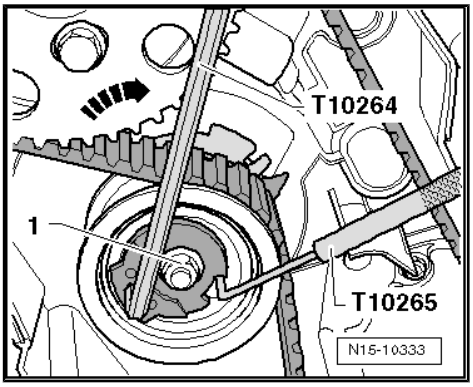
– Turn the camshaft sprocket and high-pressure pump sprocket in their elongated holes clockwise as far as the stop.
– Install toothed belt in the specified sequence:

1 - Crankshaft sprocket
2 - Tensioning roller
3 - Camshaft sprocket
4 - Coolant pump sprocket
5 - High-pressure pump sprocket
6 - Idler roller



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– Loosen nut -1- for tensioning roller and detach locking tool - T10265- .

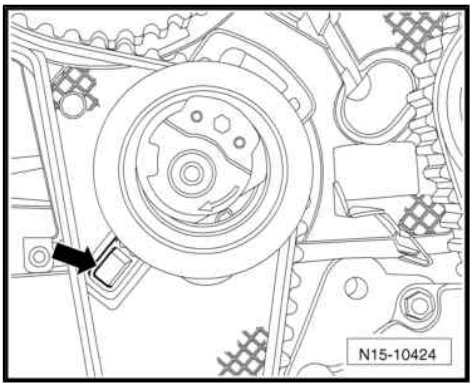


Note

Disregard -arrow-.

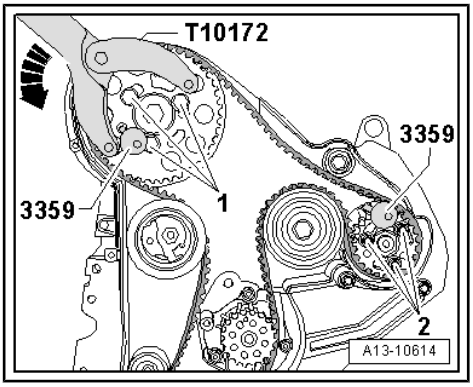
Note

Ensure that tensioning roller is seated properly in toothed belt cover (rear) -arrow-.



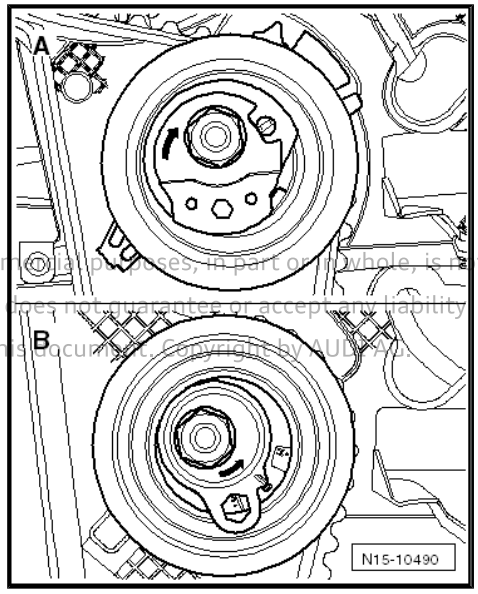
– Position counterhold tool - T10172- on camshaft sprocket as shown in illustration.
– Apply force to counterhold tool in anti-clockwise direction -arrow- and maintain tension.
– Tighten bolts -1- for camshaft sprocket and bolts -2- for high-pressure pump sprocket in this position.

• Initial tightening torque: 20 Nm

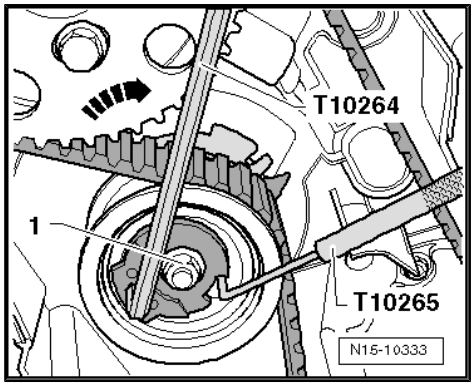


Vehicles with tensioning roller version -A-:

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– Loosen nut -1- for tensioning roller and detach locking tool - T10265- .

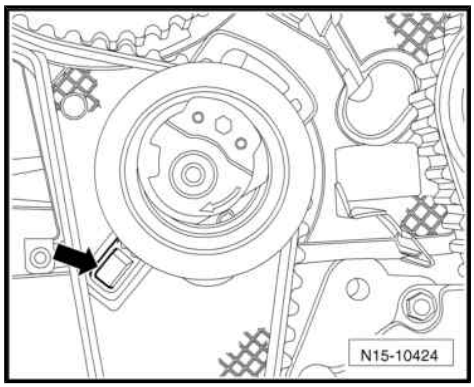


Note

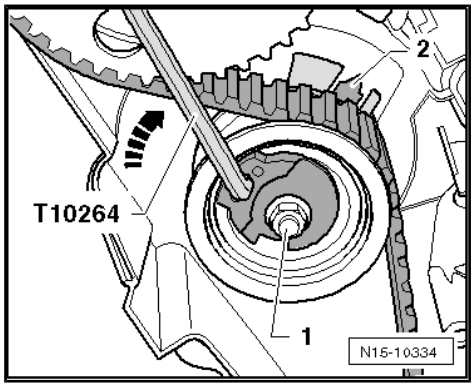
Disregard -arrow-.

Note

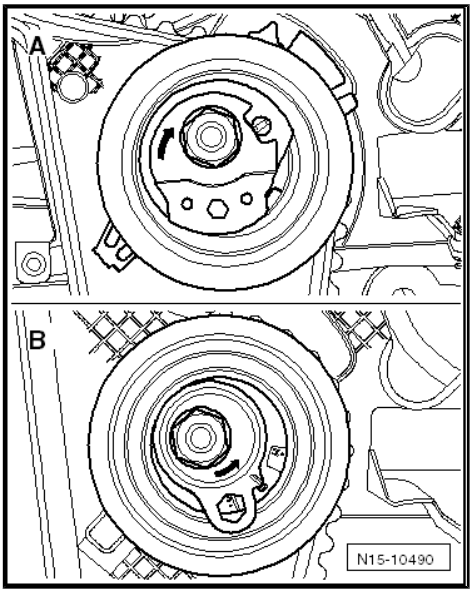
Ensure that tensioning roller is seated properly in toothed belt cover (rear) -arrow-.



– Carefully turn eccentric adjuster of tensioning roller clockwise -arrow- using offset screwdriver - T10264- until pointer -2- aligns with centre of slot on base plate.
- Nut -1- must not turn.
– Hold tensioning roller in this position and tighten nut.
– Remove locking pins -3359- and crankshaft stop - T10050- .



Vehicles with tensioning roller version -B-:

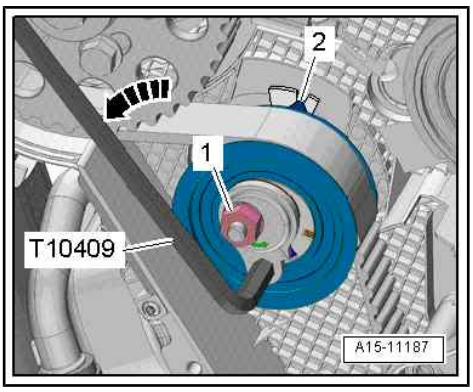


– Carefully turn eccentric adjuster of tensioning roller anti-clockwise -arrow- using offset screwdriver, 8 mm - T10409- until pointer -2- aligns approximately above the centre of the slot on the base plate.

• Nut -1- must not turn.

– Hold tensioning roller in this position and tighten nut.

– Remove locking pins -3359- and crankshaft stop - T10050- .



Checking valve timing:

Caution

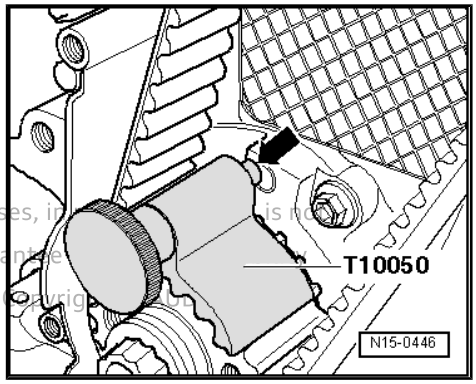
Irreparable damage can be caused if the toothed belt slips.

- *Only turn crankshaft in direction of engine rotation.*

– Turn crankshaft two rotations in direction of engine rotation by turning bolt for crankshaft sprocket until crankshaft is just before “TDC”.

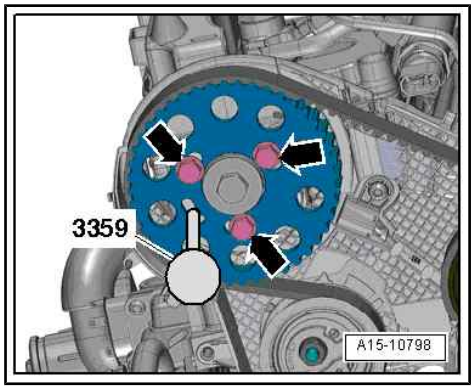
– Fit crankshaft stop - T10050- to crankshaft sprocket again.

– Turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop engages in sealing flange as crankshaft rotates.



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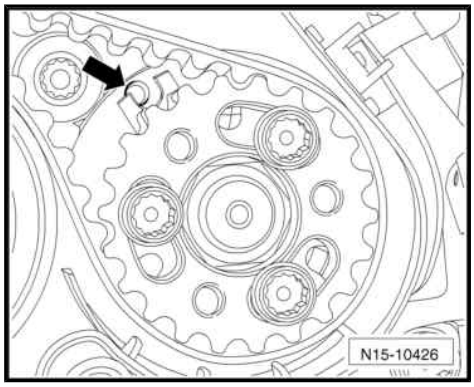
- It should now be possible to lock camshaft hub with diesel injection pump locking pin - 3359- .



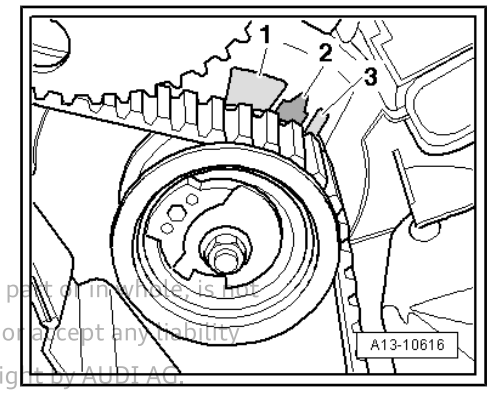
Note

Disregard -arrows-.

- It is very difficult to reproduce the locking position of the high-pressure pump hub. However, a slight deviation -arrow- does not influence engine operation.



- Pointer -2- on tensioner roller must be centred between tabs -1- and -3- on base plate.



Note

- *This applies to both versions of tensioner roller.*
- *The maximum permissible sideways deviation from the specified position is 5 mm.*

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- Re-adjust valve timing if requirements are not met ⇒ page 116 .
- If requirements are met, continue with procedure after adjusting valve timing correctly as described below ⇒ page 117 .

Re-adjusting valve timing:

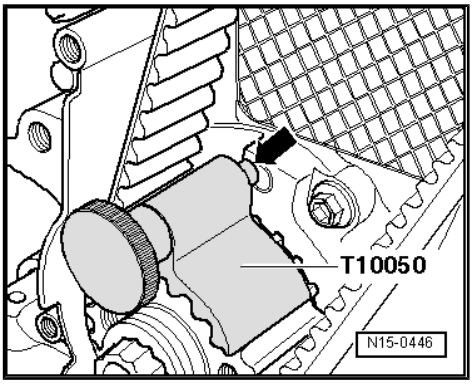
– If camshaft hub cannot be locked, withdraw crankshaft stop - T10050- until pin is clear of bore.

– Turn crankshaft in opposite direction of engine rotation slightly past “TDC”.

– Now turn crankshaft slowly in direction of engine rotation until it is possible to lock camshaft hub.

– Loosen bolts for camshaft sprocket after locking hub.

A - If pin -arrow- of crankshaft stop - T10050- is on left side of bore:



– Turn crankshaft in direction of engine rotation until pin of crankshaft stop engages in sealing flange as crankshaft rotates.

– Tighten camshaft sprocket bolts to 20 Nm initially.

B - If pin -arrow- of crankshaft stop - T10050- is on right side of bore:

– Turn crankshaft slightly in opposite direction to engine rotation.

– Turn crankshaft in direction of engine rotation again until pin of crankshaft stop engages in sealing flange as crankshaft rotates.

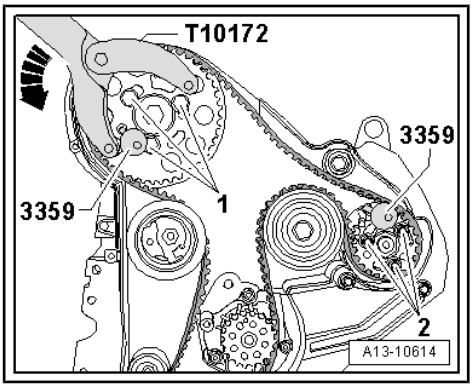
– Tighten camshaft sprocket bolts to 20 Nm initially.

Procedure after adjusting valve timing correctly:

– Remove diesel injection pump locking pin - 3359- and crankshaft stop - T10050- .

– Turn crankshaft two rotations in direction of engine rotation by turning bolt for crankshaft sprocket until crankshaft is just before “TDC”.

– Check valve timing once again ⇒ page 115 .



– If camshaft hub can now be locked, tighten camshaft sprocket bolts -1- to final torque ⇒ Item 10 (page 101) .

– Tighten bolts -2- for high-pressure pump sprocket to final torque ⇒ Rep. gr. 23 .

– Check valve timing once again ⇒ page 115 .

Assembling

Installation is carried out in the reverse order; note the following:

Tightening torque

◆ ⇒ “1.1 Exploded view - toothed belt”, page 101 , ⇒ Fig. ““Toothed belt cover (bottom and centre) - tightening torque”“ , page 103

Note

◆ *Renew seals and/or gaskets.*

◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install vibration damper ⇒ page 65 .

– Install coolant pipe (right-side) ⇒ page 227 .

– Install fuel filter ⇒ Rep. gr. 20 .

– Install pressure differential sender - G505- ⇒ Rep. gr. 23 .

– Install filler pipe with filler neck for washer fluid reservoir ⇒ Electrical system; Rep. gr. 92 .

– Install noise insulation frame (if fitted) and noise insulation ⇒ Rep. gr. 50 .

– Fit front wheel ⇒ Wheels and tyres; Rep. gr. 44 .

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2 Cylinder head

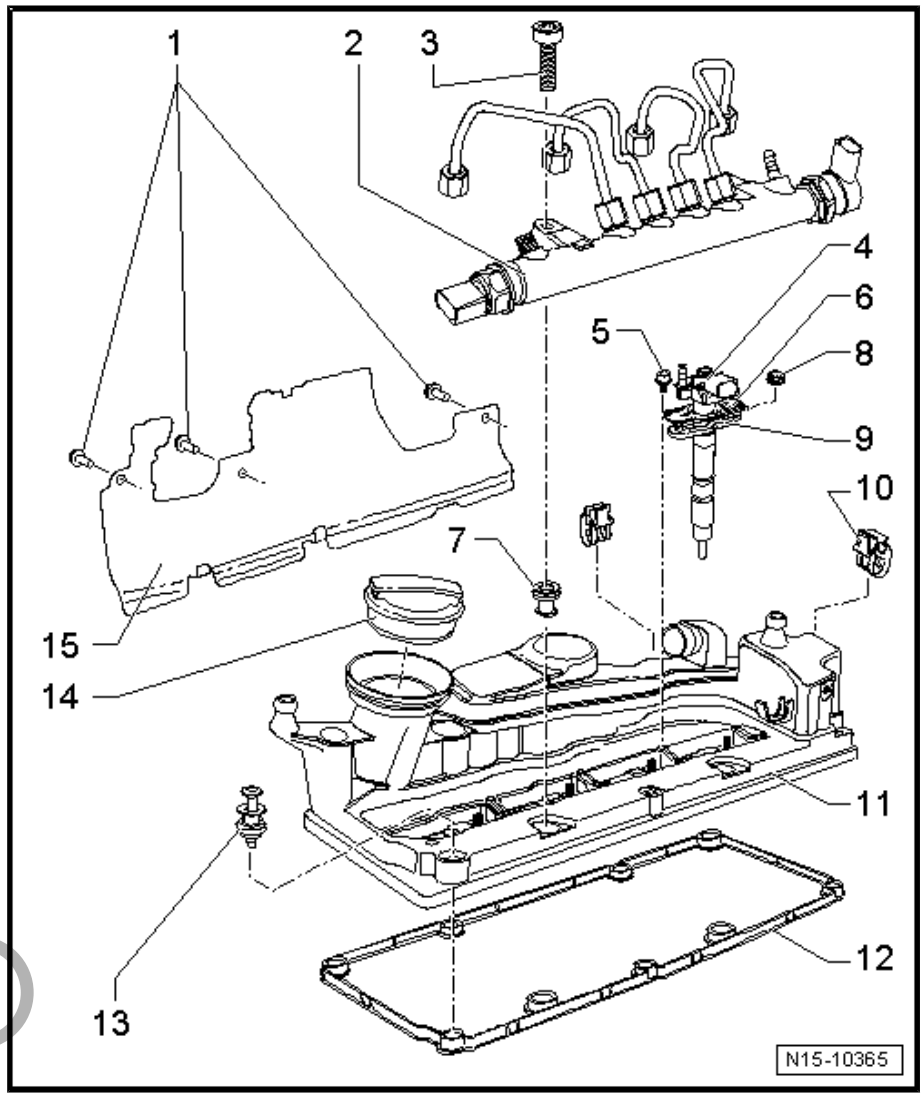
Overview

- ⇒ “2.1 Exploded view - cylinder head cover”, page 118
- ⇒ “2.2 Removing and installing cylinder head cover”, page 119
- ⇒ “2.3 Exploded view - cylinder head”, page 121
- ⇒ “2.4 Removing and installing cylinder head”, page 123
- ⇒ “2.5 Checking compression”, page 136

Note

Audi A3 models with 2.0 ltr. 4-valve common rail TDI engine are always equipped with steel glow plugs.

2.1 Exploded view - cylinder head cover



1 - Bolts
- ❑ 5 Nm

2 - Fuel rail
- ❑ Observe rules for cleanliness ⇒ page 5
- ❑ Do not attempt to bend high-pressure pipes to a different shape
- ❑ Installing high-pressure pipes ⇒ Rep. gr. 23

3 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

4 - Injector
- ❑ Observe rules for cleanliness ⇒ page 5
- ❑ Removing and installing ⇒ Rep. gr. 23

5 - Bolt
- ❑ Tightening torque ⇒ Rep. gr. 23

6 - Cover for injector

7 - Bush for high-pressure reservoir
- ❑ Renew if damaged or leaking

8 - Nut
- ❑ Tightening torque ⇒ Rep. gr. 23

9 - Clamping piece

10 - Cable guide

11 - Cylinder head cover
- ❑ Removing and installing ⇒ page 119

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12 - Gasket

- ❑ Renew if damaged or leaking

13 - Bolt

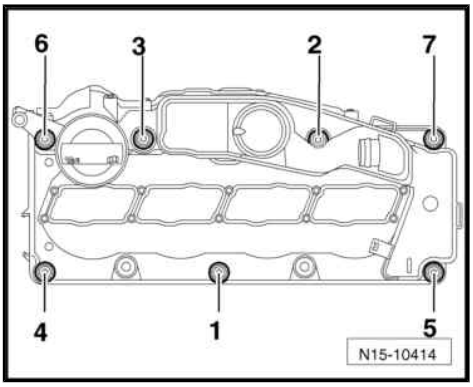
- ❑ Renew if gasket is damaged
- ❑ Tightening torque and sequence ⇒ page 119

14 - Filler cap

15 - Heat shield

Cylinder head cover - tightening torque and sequence

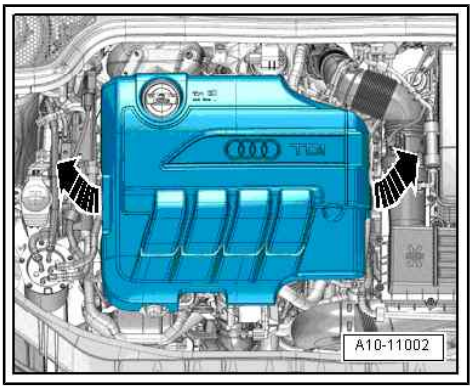
– Tighten bolts for cylinder head cover in the sequence -1 ... 7- to 9 Nm.



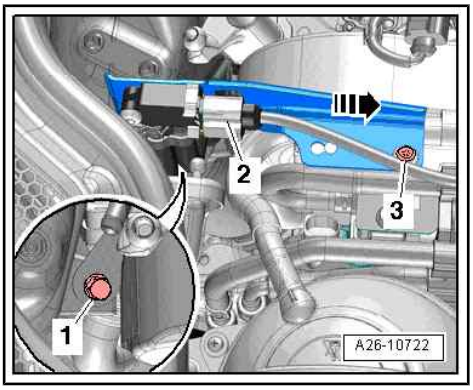
2.2 Removing and installing cylinder head cover

Removing

– Remove engine cover panel -arrows-.



– Unplug electrical connector -2- on exhaust gas pressure sensor 1 - G450- .

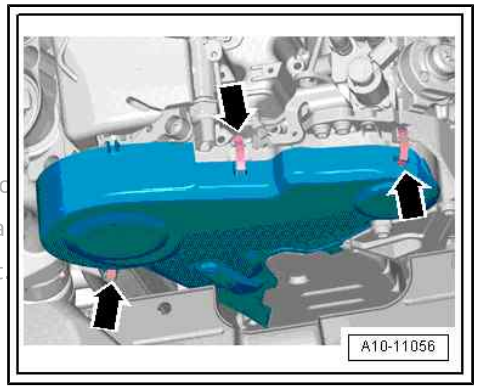


Note

Disregard -item 1-.

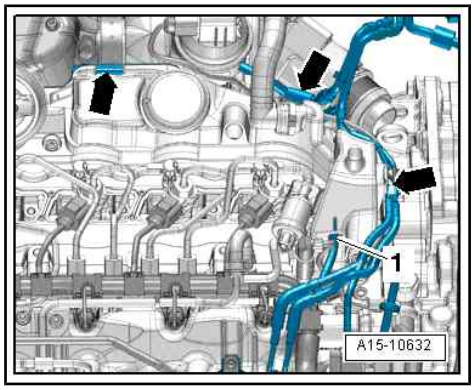
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– Unfasten clips -arrows- and press toothed belt cover (top) to right side.



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– Remove injectors ⇒ Rep. gr. 23 .
– Disconnect vacuum hose -1- from cylinder head cover.
– Move electrical wiring and remaining vacuum hoses clear -arrows-.



USA models:

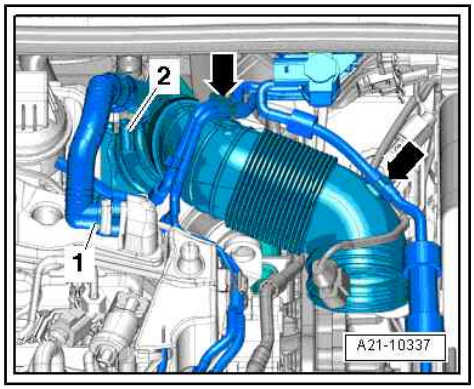
Caution

Risk of violating emission legislation applying to USA models.

- ***Do NOT open hose connection for crankcase breather system -1-. Only open other side of hose connection.***

Rest-of-world vehicles:

– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.

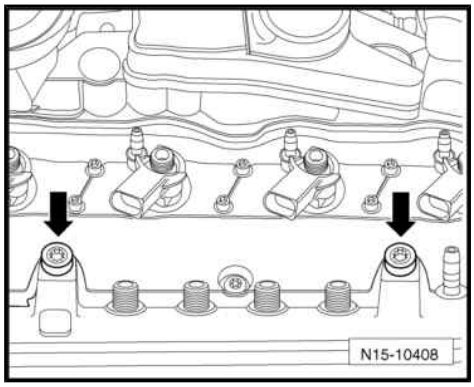


Note

-Item 2- and -arrows- can be disregarded.

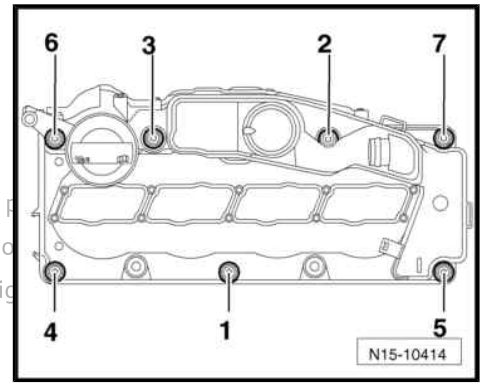
All vehicles:

– Remove bolts -arrows- and detach high-pressure reservoir from cylinder head cover.



– Slacken cylinder head cover bolts in the sequence -7 ... 1-.

– Remove bolts and take off cylinder head cover.



USA models:

– Remove bolts and move cylinder head cover to one side with crankcase breather hose connected.

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Installing

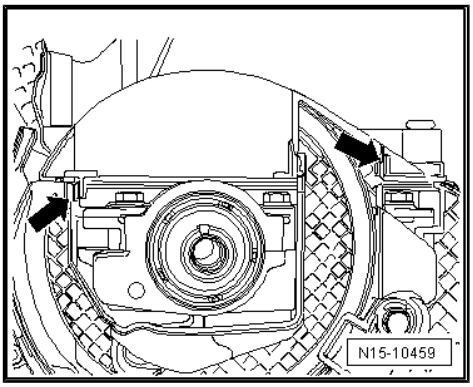
Installation is carried out in reverse order; note the following:

Note

Renew gasket for cylinder head cover and bolts for cylinder head cover if damaged or leaking.

– Tighten cylinder head cover bolts ⇒ page 119 .

– Make sure that cylinder head cover is clipped properly to toothed belt cover.



Note

For illustration purposes, the installation position is shown with the camshaft sprocket removed.

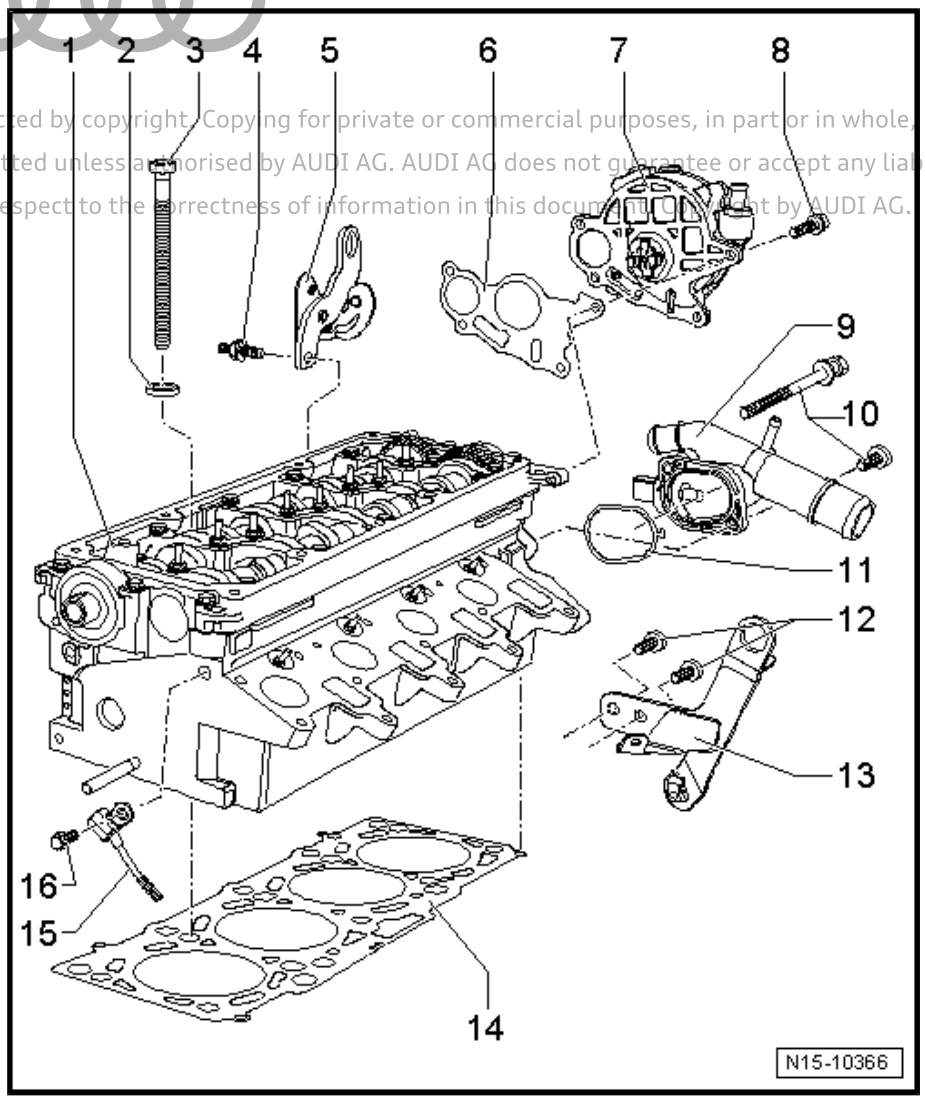
– Use screwdriver to press clips -arrows- on toothed belt cover onto cylinder head cover until they engage with a click.

– Make sure there is a clearance between hub and toothed belt cover.

– Install high-pressure reservoir and injectors ⇒ Rep. gr. 23 .

2.3 Exploded view - cylinder head

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1 - Cylinder head

- ❑ Removing and installing ⇒ page 123
- ❑ To prevent damage to glow plugs, always place cylinder head on a soft foam surface after removal.
- ❑ Checking for distortion ⇒ page 123
- ❑ Must not be machined
- ❑ If renewed, change coolant and engine oil

2 - Washer

3 - Bolt

- ❑ Renew
- ❑ Correct sequence when slackening ⇒ page 133
- ❑ Tightening torque and sequence ⇒ page 123

4 - Bolt

- ❑ 20 Nm

5 - Engine lifting eye

6 - Gasket

- ❑ Renew

7 - Vacuum pump

- ❑ Removing and installing ⇒ Rep. gr. 47

8 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 47

9 - Connection

10 - Bolts

- ❑ Tightening torque ⇒ Item 19 (page 212)

11 - Gasket

- ❑ Renew

12 - Bolts

- ❑ 20 Nm

13 - Engine lifting eye

14 - Cylinder head gasket

- ❑ Renewing ⇒ “2.4 Removing and installing cylinder head”, page 123
- ❑ Identification of cylinder head gasket ⇒ page 123
- ❑ If renewed, change coolant and engine oil

15 - Hall sender - G40-

- ❑ For camshaft position

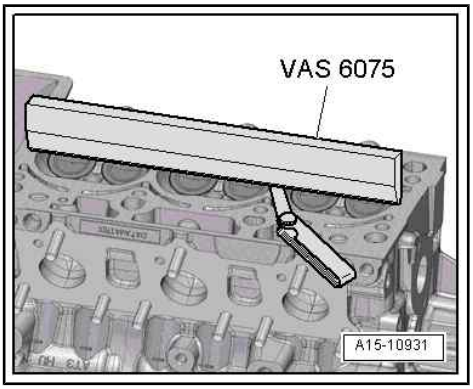
16 - Bolt

- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 10 Nm

Checking cylinder head for distortion

– Use straight edge 500 mm - VAS 6075- and feeler gauge to measure cylinder head for distortion at several points.

• Max. permissible distortion: 0.1 mm.



Note

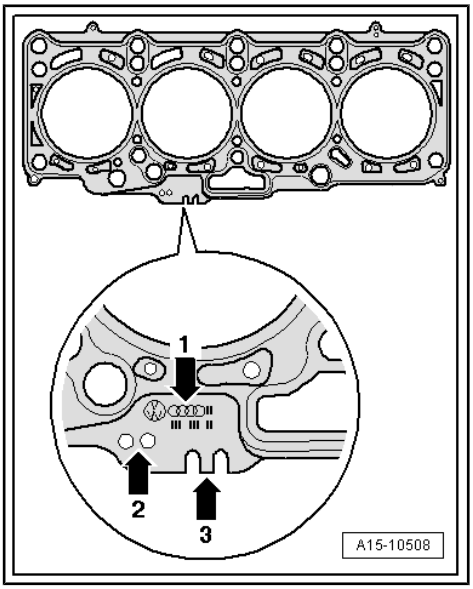
Cylinder heads must not be reworked on TDI engines.

Identification of cylinder head gasket

1 - Part number

2 - Holes

3 - Ignore



Note

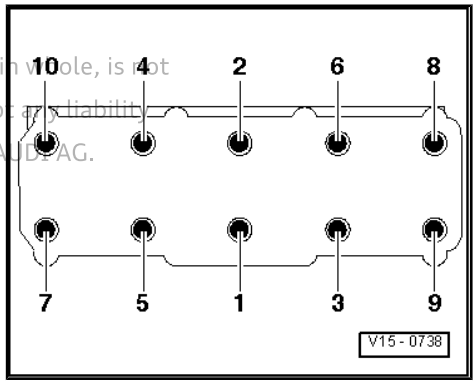
Cylinder head gaskets of different thicknesses are fitted depending on the amount of piston projection ⇒ page 98 . When renewing only the cylinder head gasket, the new gasket should have the same identification as the old one.

Cylinder head - tightening torque and sequence

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Note

Renew bolts tightened with specified tightening angle.

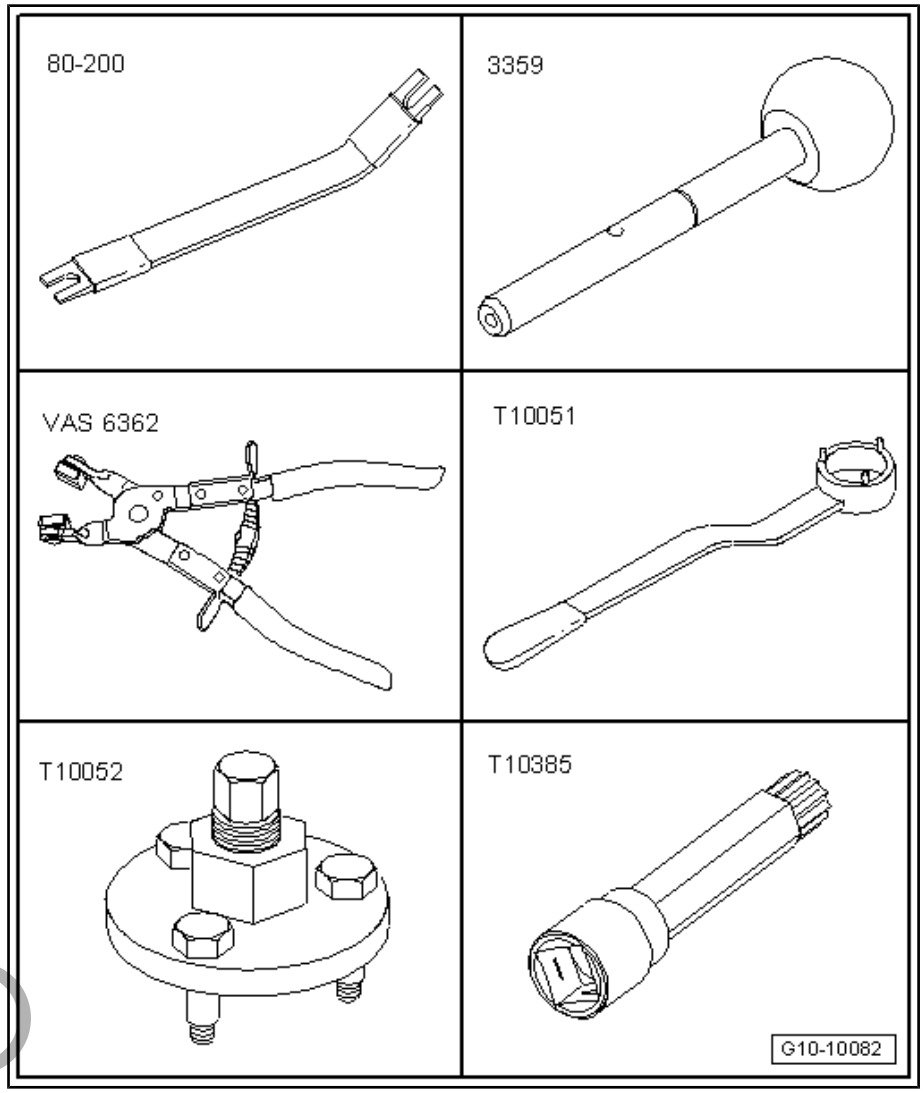


– Tighten bolts in 4 stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 10-	30 Nm
2.	-1 … 10-	50 Nm
3.	-1 … 10-	Turn 90° further
4.	-1 … 10-	Turn 90° further

2.4 Removing and installing cylinder head

Special tools and workshop equipment required

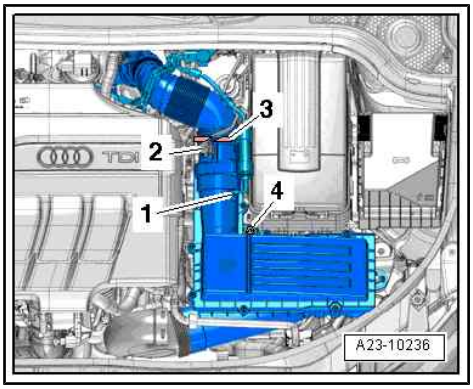


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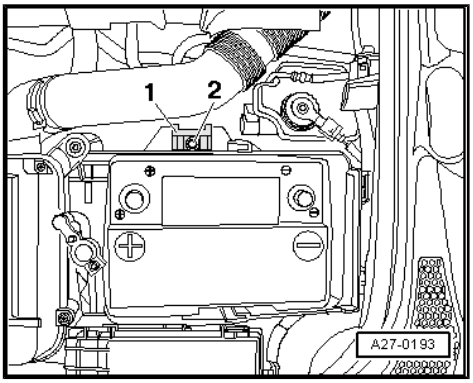
- Removal lever - 80 - 200-
- Diesel injection pump locking pin - 3359-
- Hose clip pliers - VAS 6362-
- Counterhold tool - T10051-
- Puller - T10052-
- Bit XZN 10 - T10385-

Removing

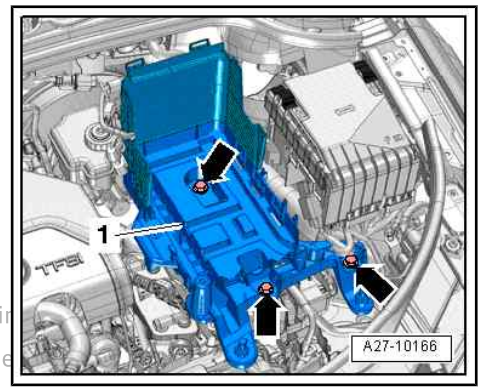
– Drain coolant ⇒ page 196 .
– Remove radiator cowl ⇒ page 234 .
– Remove air cleaner housing ⇒ Rep. gr. 23 .



– Remove battery ⇒ Electrical system; Rep. gr. 27 .



– Remove bolts -arrows- and take out battery tray -1-.

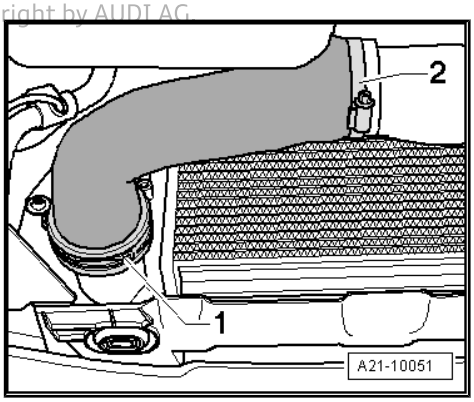


Note

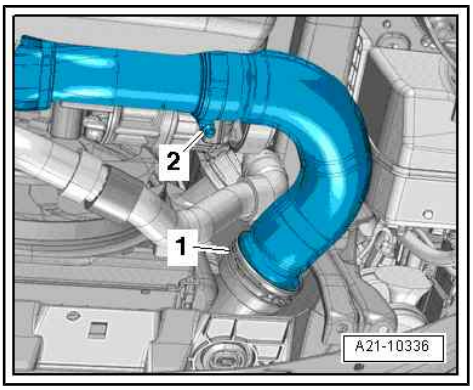
The battery mounting does not have to be removed on vehicles with engine code CBEA.

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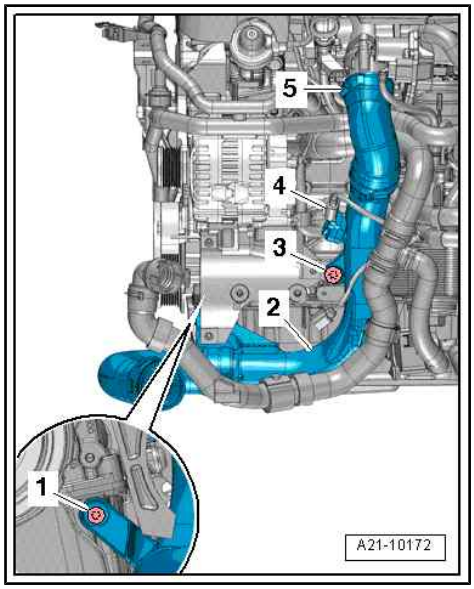
– Release hose clip -2-, lift retaining clip -1- and remove air hose.



– Release hose clip -2-, lift retaining clip -1- and remove air hose.



– Remove bolts -1- and -3-.
– Slacken hose clip -5- at intake manifold flap motor - V157- or throttle valve module - J338- , detach air pipe -2- but do not remove.

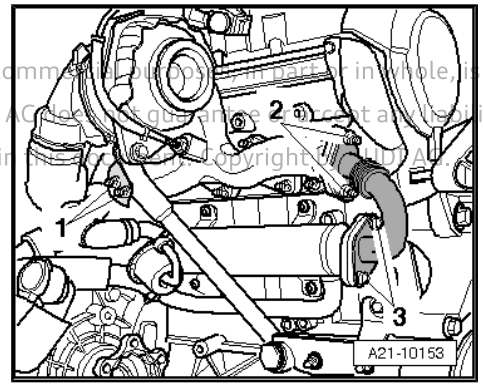


Note

Disregard -item 4-.

The following step is only required on vehicles with engine codes CBAA, CBAB, CBBB:

– Remove nuts -2- and bolts -3-, and detach exhaust gas recirculation pipe.



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Note

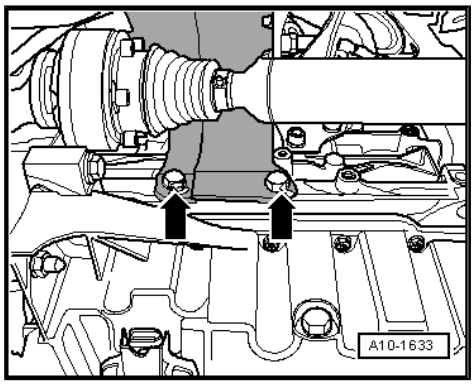
Disregard -item 1-.

The following steps are only required on vehicles with engine code CBEA:

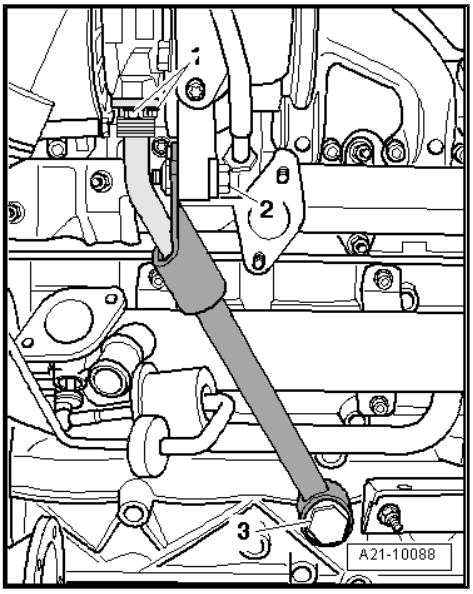
– Remove filter ⇒ page 345 .
– Remove connecting pipe ⇒ Item 2 (page 344) between housing for exhaust gas recirculation and connection for turbocharger ⇒ Item 33 (page 255) .

All vehicles

– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).



– Remove bolts -1, 2- and banjo bolt -3-.
– Detach support for turbocharger with oil return pipe.



– Remove nuts -2-.

Note

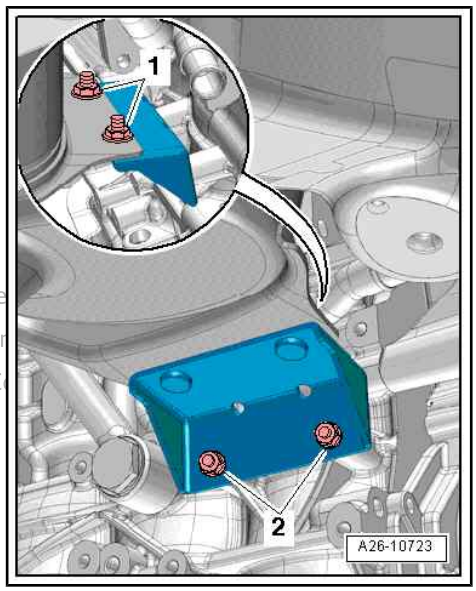
Disregard -item 1-.

USA models:

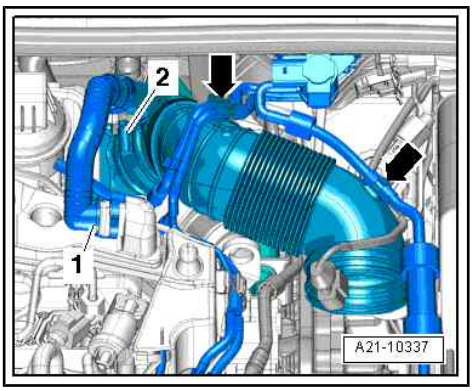
Caution

Risk of violating emission legislation applying to USA models.

- ***Do NOT open hose connection for crankcase breather system -1-. Only open other side of hose connection.***



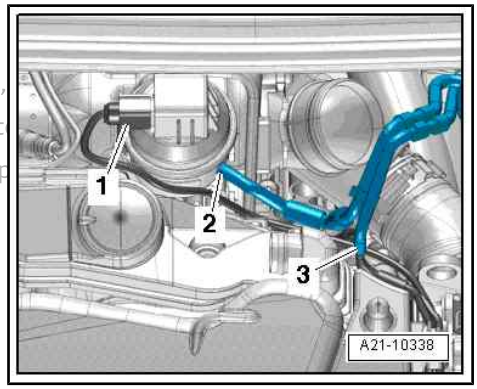
– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows- at air pipe.
– Loosen hose clip -2- and detach air pipe.



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– Unplug electrical connector -1- at position sender for charge pressure positioner - G581- .
– Detach vacuum hose -2- from vacuum unit of turbocharger.
– Disconnect vacuum hose -3-.
– Remove exhaust gas temperature sender 1 - G235- ⇒ page 292 .

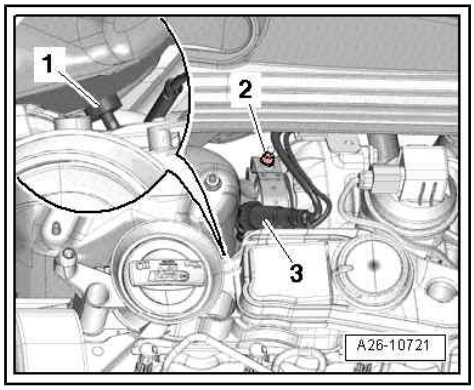


– Slacken bolt -2- and remove clamp.

Note

Disregard items -1 and 3-.

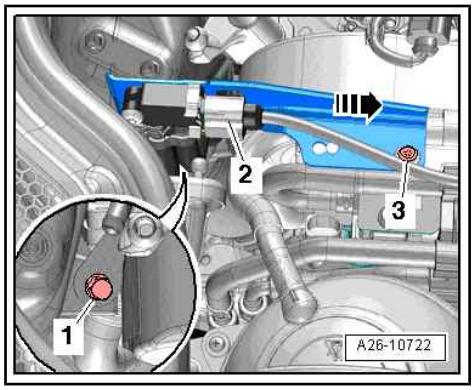
– Move clear electrical wiring at turbocharger.



– Unplug electrical connector -2- on exhaust gas pressure sensor.
– Remove bolt -3- and detach exhaust gas pressure sensor 1 - G450- from bracket -arrow-.
– Remove upper bolt -1- at bracket for particulate filter and tie particulate filter to rear.

Note

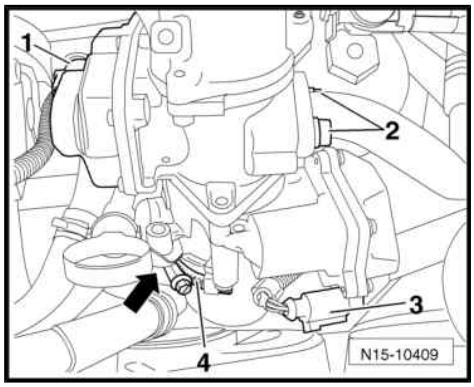
The installation position can vary depending on version.



– Unplug electrical connectors -1- at exhaust gas recirculation valve - N18- and -3- at intake manifold flap motor - V157- or throttle valve module - J338- .
– Remove bolt -arrow- for dipstick guide tube.
– Remove bolts -2- for exhaust gas recirculation pipe.

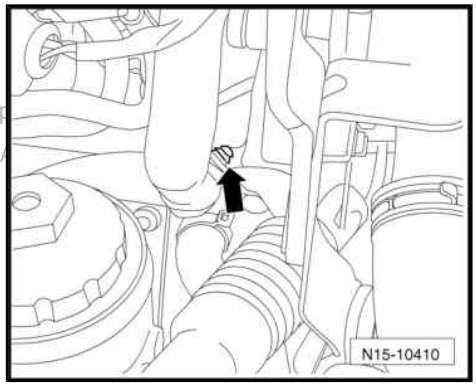
Note

Disregard -item 4-.



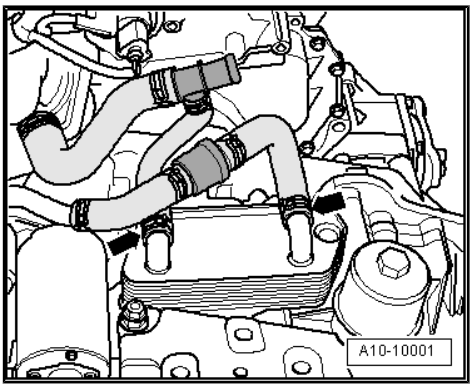
– Unclip wiring harness from retainer -arrow-.

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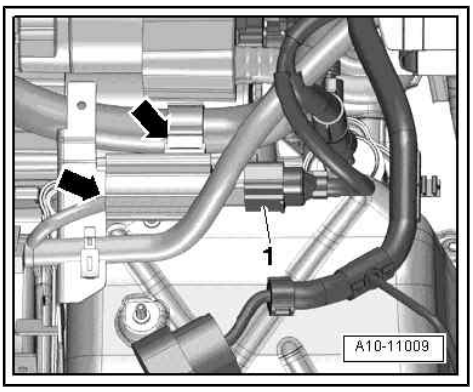
Vehicles with dual clutch gearbox:

– Slacken hose clips -arrows- and detach coolant hoses from gear oil cooler.



All vehicles (continued):

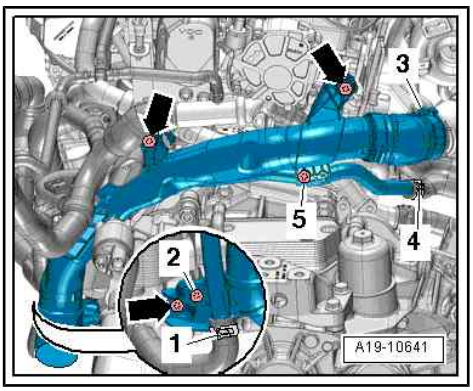
– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.



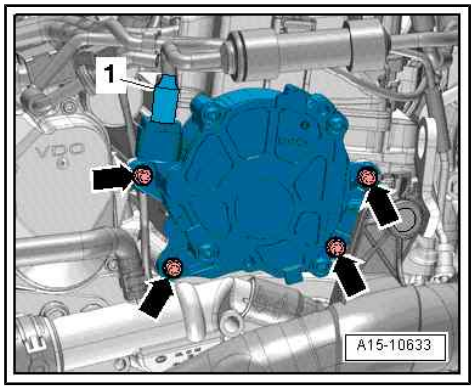
– Remove bolts -2, 5- and -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Loosen hose clip -3- and detach air pipe (left-side).

Note

Disregard items -1 and 4-.



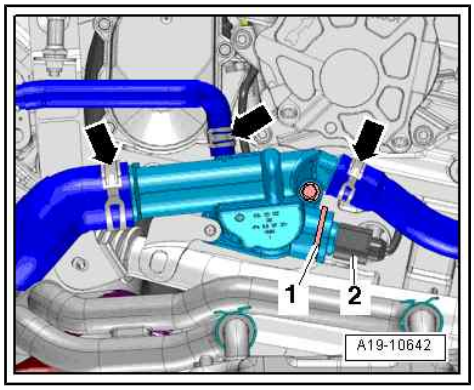
– Disconnect vacuum hose -1- from vacuum pump.



Note

Disregard -arrows-.

– Unplug electrical connector -2- at coolant temperature sender - G62- .
– Slacken hose clips -arrows- and detach coolant hoses from connection.



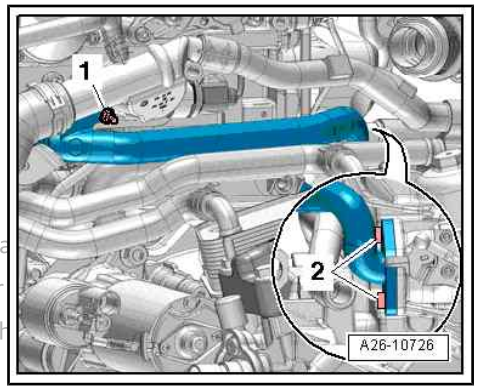
Note

Disregard -item 1-.

Caution

Risk of cracking in flexible joint.

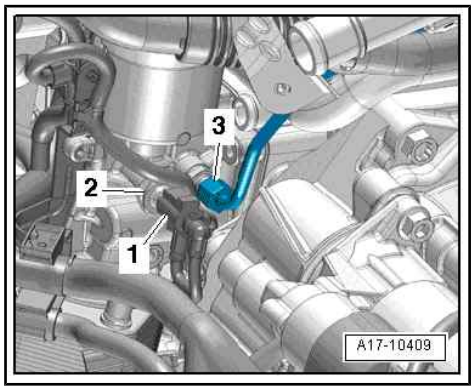
- ***Do not bend flexible joint in exhaust gas recirculation pipe.***



– Remove nut -1- and bolts -2-, detach exhaust gas recirculation pipe.

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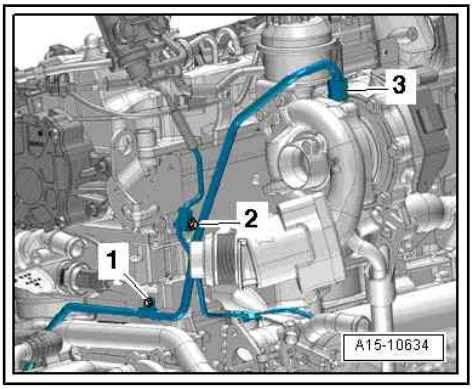
– Disconnect oil supply line from connection on oil filter bracket. To do so, counterhold at hexagon flats with an open-end spanner and loosen union nut -3-.



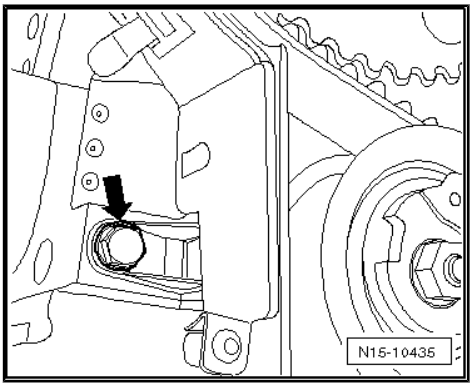
Note

Disregard items -1 and 2-.

– Remove nut -2- at retaining clip for vacuum line.
– Remove bolt -1-.
– Unscrew oil supply line from connection on turbocharger. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut -3-.



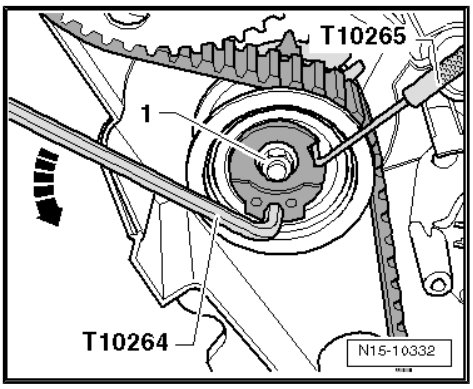
– Remove bolt -arrow- for toothed belt cover (rear).
– Take toothed belt off camshaft sprocket ⇒ page 103 .



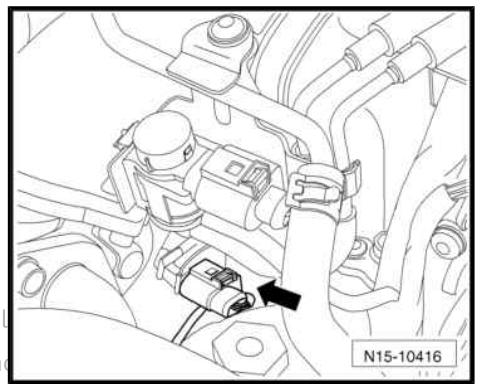
– Unscrew nut -1-.

Note

Disregard -arrow-.

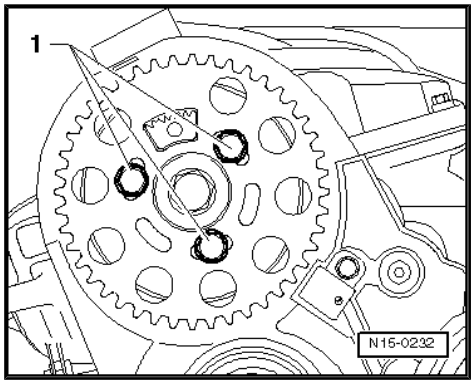


– Unplug electrical connector -arrow- at Hall sender - G40- .
– Remove cylinder head cover ⇒ page 119 .
– Unplug electrical connectors on glow plugs ⇒ Rep. gr. 28 .

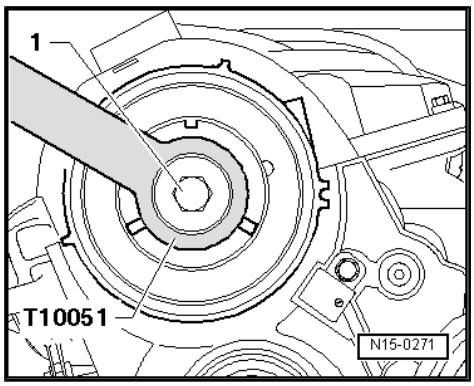


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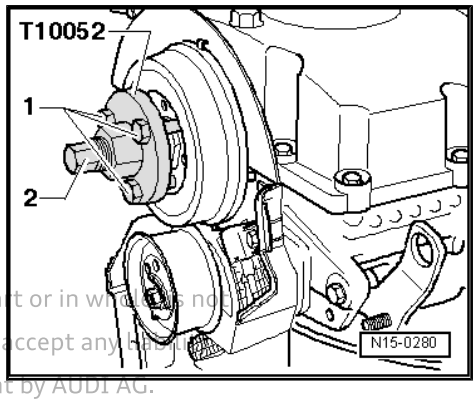
– Remove bolts -1- and detach camshaft sprocket.



– Counterhold using counterhold tool - T10051- and loosen bolt -1- for camshaft hub.
– Unscrew bolt approx. 2 turns.

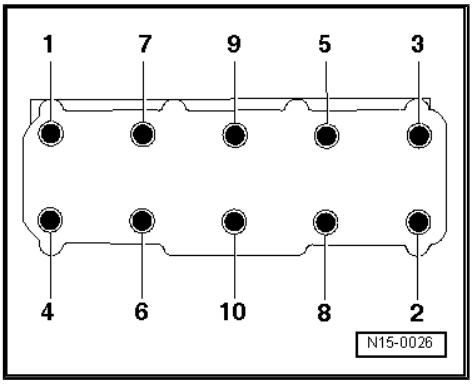


– Apply puller - T10052- to camshaft hub and screw bolts -1- into hub.
– Counterhold on hexagon flats (30 mm) of puller and screw in bolt -2- to pull off camshaft hub.
– Detach hub from taper of camshaft.



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– Slacken cylinder head bolts in the sequence -1 ... 10-.



Note

A second mechanic is required for removal of the cylinder head.

– Swivel cylinder head to left and out of rear toothed belt cover and detach tensioning roller at the same time.

– Take care not to damage oil return line for turbocharger.

– Take care to place cylinder head down without bending oil return line. If necessary, place a block of wood below exhaust manifold.

Caution

Risk of damage to glow plugs when putting down cylinder head.

- ***After removal, the cylinder head must not be put down on the gasket side with the glow plugs still installed, because the glow plugs project slightly beyond the gasket surface.***

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Note

Audi A3 models with 2.0 ltr. 4-valve common rail TDI engine are always equipped with steel glow plugs.

Installing

- Tightening torques
⇒ “2.3 Exploded view - cylinder head”, page 121



Note

- *Do NOT use abrasive materials (sandpaper, sanding discs, sanding pads, abrasive web, wire wool, etc.).*
- *Sealing surface (see photo) must not be raised.*
- *Dark discolouration (see photo) does not have to be removed.*
- *When removing sealant residue, make sure none of the residue enters the open channels of the engine.*
- *Ensure that nearby workspaces are kept clean and that the abrasive materials listed above are not being used there.*
- *Use of non-approved abrasive materials can lead to subsequent damage to the turbocharger, conrod bearings, etc.*

Note

- *Renew bolts tightened with specified tightening angle.*
- *Renew self-locking nuts as well as seals, gaskets and O-rings.*
- *Cylinder heads must not be reworked on TDI engines.*
- *When installing an exchange cylinder head, the contact surfaces between roller rocker fingers and cams must be oiled.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*
- *After fitting a new cylinder head or cylinder head gasket, change the engine oil and the coolant in the entire cooling system.*

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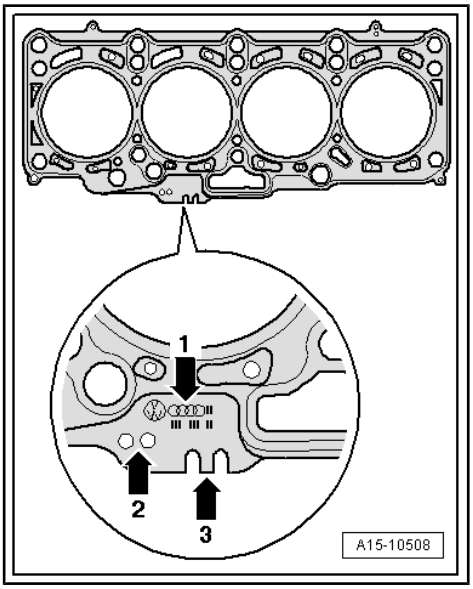
– Before fitting cylinder head, remove crankshaft stop - T10050- and turn crankshaft against normal direction of rotation until all pistons are positioned approximately equally below “TDC”.
– If not already fitted, install dowel sleeves for centring cylinder block and cylinder head in cylinder block.

– Note cylinder head gasket identification:

1 - Part number

2 - Holes

3 - Ignore

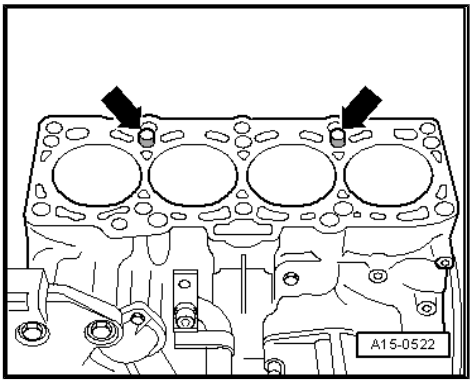


Note

- *If the cylinder head gasket or cylinder head have been replaced, select the new cylinder head gasket according to the number of holes on the old gasket.*
- *If parts of the crankshaft drive have been renewed, the new cylinder head gasket must be selected by measuring the piston projection at "TDC"* ⇒ page 98 .

– Fit cylinder head gasket onto dowel sleeves -arrows- in cylinder block.

• Installation position of cylinder head gasket: the word "oben" (top) or the part number should face towards the cylinder head.



Note

A second mechanic is required for fitting cylinder head.

– Swivel cylinder head so that stud for toothed belt tensioning roller is inserted into aperture in toothed belt cover (rear) and attach tensioning roller at the same time.

Note

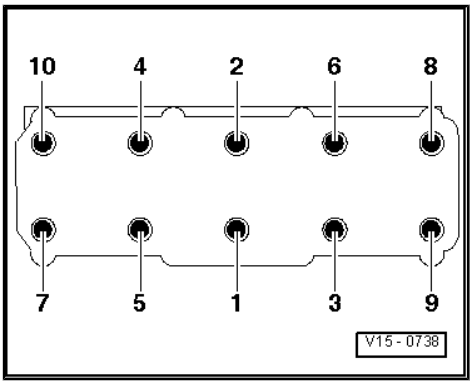
Make sure that electrical wiring to Hall sender - G40- is properly routed.

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– Fit cylinder head.

– Screw in cylinder head bolts by hand until they make contact.

– Tighten cylinder head bolts ⇒ page 123 .

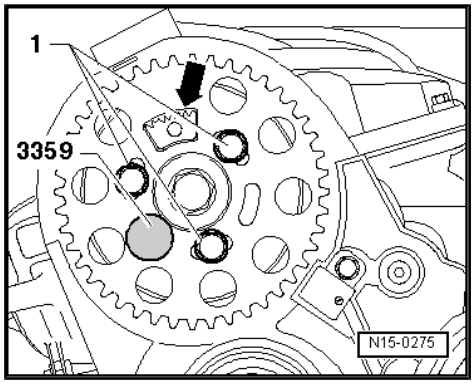


Note

Cylinder head bolts do not have to be torqued down again later after repair work.

– Install rear toothed belt cover, camshaft hub and sprocket ⇒ page 101 .

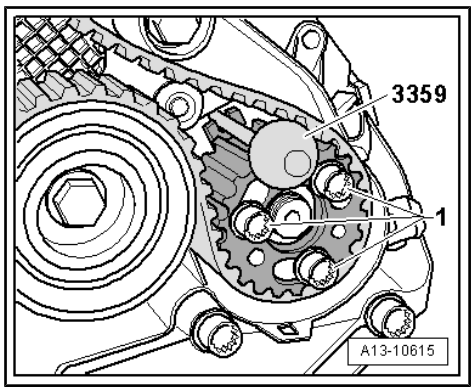
– Lock camshaft hub with diesel injection pump locking pin - 3359- .



Note

Disregard -item 1- and -arrow-.

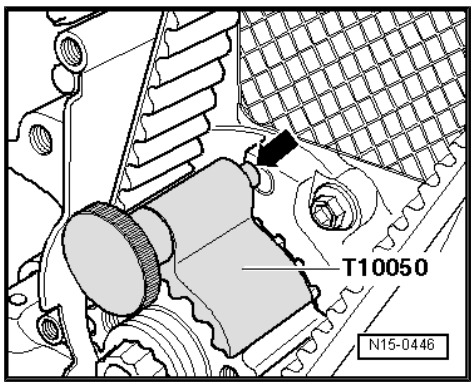
– Lock high-pressure pump hub with diesel injection pump locking pin - 3359- .



Note

Disregard -item 1-.

– Then turn crankshaft in direction of engine rotation until pin -arrow- on crankshaft stop - T10050- engages in sealing flange as crankshaft rotates.



– Install toothed belt (adjust valve timing) ⇒ page 110 .

Remaining installation steps are carried out in reverse sequence; note the following:

– Install cylinder head cover ⇒ page 119 .
– Install oil supply line ⇒ Item 6 (page 178) .
– Install exhaust gas recirculation pipes ⇒ page 297 .
– Install air pipe (left-side) ⇒ page 268 .
– Install dipstick guide tube ⇒ page 180 .
– Install particulate filter ⇒ page 279 .
– Install exhaust gas temperature sender 1 - G235- ⇒ page 292 .
– Install heat shield for drive shaft (right-side) ⇒ page 40 .
– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install support for turbocharger ⇒ page 239 .
– Install air hose with plug-in connector ⇒ page 270 .
– Install radiator cowl ⇒ page 234 .
– Change engine oil ⇒ Maintenance ; Booklet 808 .
– Fill cooling system with fresh coolant ⇒ page 200 .

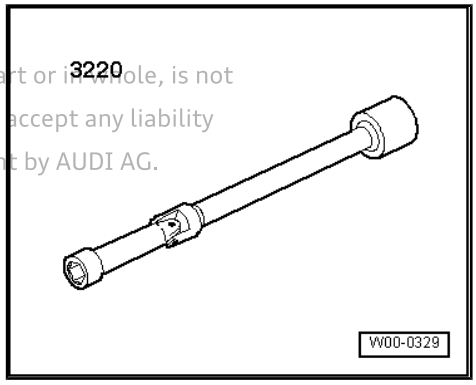
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2.5 Checking compression

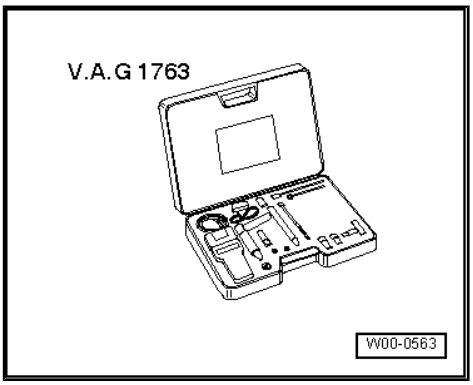
Special tools and workshop equipment required

♦ Jointed spanner - 3220-

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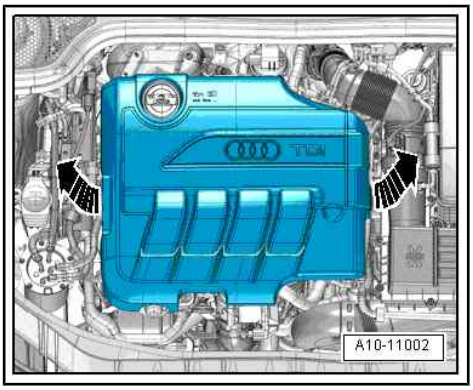
♦ Compression tester - V.A.G 1763- with adapter - V.A.G 1763/8-



Procedure

- Engine oil temperature at least 30 °C
- Battery voltage at least 12.5 V

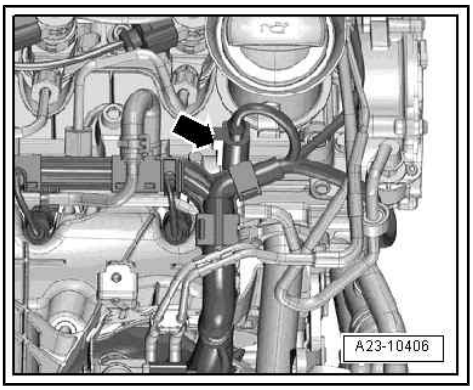
– Remove engine cover panel -arrows-.



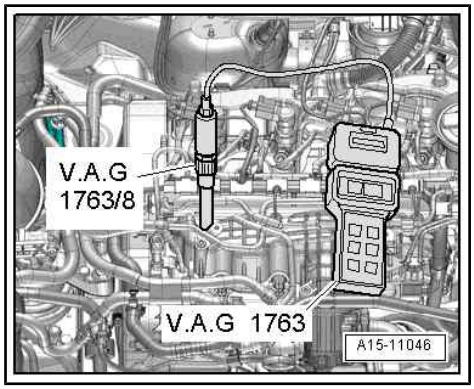
– Unplug electrical connector -arrow- for fuel pressure regulating valve - N276- at fuel rail.

– Briefly start engine to relieve fuel pressure in fuel rail.

– Remove all glow plugs ⇒ Rep. gr. 28 .



– Screw in adapter - V.A.G 1763/8- in place of corresponding glow plug and connect compression tester - V.A.G 1763- .



Note

Using the compression tester ⇒ Operating instructions .

– Have a second mechanic operate starter until tester shows no further pressure increase.
– Repeat procedure on each cylinder.

Compression pressure	bar
When new	25.0 … 31.0
Wear limit	19.0
Maximum difference between cylinders	5.0

Assembling

Installation is carried out in the reverse order; note the following:

– Install glow plugs ⇒ Rep. gr. 28 .
– Entries are stored in event memory of engine control unit because electrical connectors were unplugged and the engine was started: `Interrogate event memory` in `Vehicle self-diagnosis` ⇒ Vehicle diagnostic tester.

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3 Valve gear

Overview

- ⇒ “3.1 Exploded view - valve gear”, page 139
- ⇒ “3.2 Measuring axial clearance of camshafts”, page 141
- ⇒ “3.3 Measuring radial clearance of camshafts”, page 142
- ⇒ “3.4 Renewing camshaft oil seal”, page 143
- ⇒ “3.5 Removing and installing camshafts”, page 145
- ⇒ “3.6 Renewing valve stem oil seals with cylinder head installed”, page 151
- ⇒ “3.7 Renewing valve stem oil seals with cylinder head removed”, page 154
- ⇒ “3.8 Valve dimensions”, page 158
- ⇒ “3.9 Machining valve seats”, page 158
- ⇒ “3.10 Checking valve guides”, page 158
- ⇒ “3.11 Checking valves”, page 159

Caution

Risk of damage to valves and piston crowns after working on valve gear.

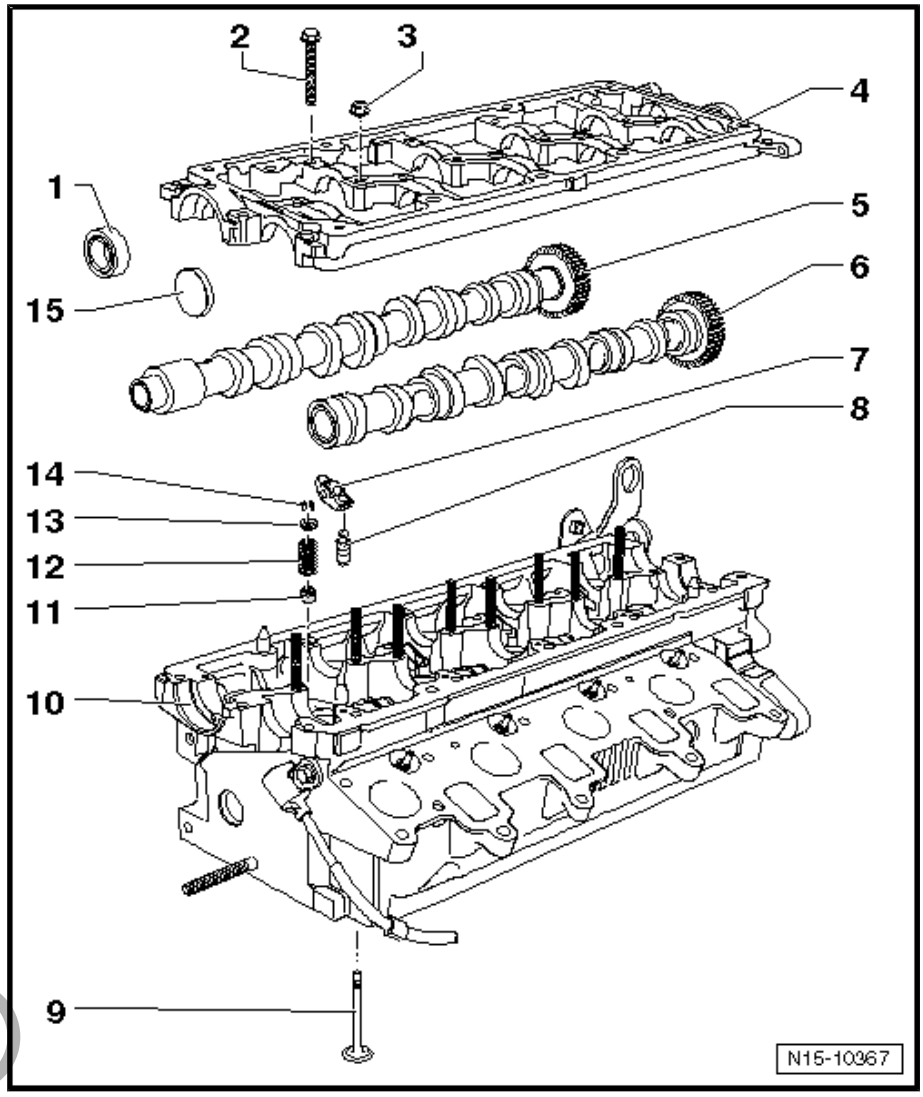
- *The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.*
- *Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

Note

Cylinder heads with cracks between the valve seats may be used without reducing engine life, provided the cracks are small and not more than 0.5 mm wide.

3.1 Exploded view - valve gear

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1 - Oil seal

- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ❑ Renewing ⇒ page 143

2 - Bolt

- ❑ Correct sequence when slackening ⇒ page 148
- ❑ Tightening torque and sequence ⇒ page 141

3 - Nut

- ❑ Correct sequence when slackening ⇒ page 148
- ❑ Tightening torque and sequence ⇒ page 141

4 - Retaining frame

- ❑ With integrated camshaft bearings
- ❑ Removing and installing ⇒ “3.5 Removing and installing camshafts”, page 145

5 - Exhaust camshaft

- ❑ Removing and installing ⇒ page 145
- ❑ Measuring axial clearance ⇒ page 141
- ❑ Measuring radial clearance ⇒ page 142

6 - Inlet camshaft

- ❑ Removing and installing ⇒ page 145
- ❑ Measuring axial clearance ⇒ page 141
- ❑ Measuring radial clearance ⇒ page 142

7 - Roller rocker finger

- ❑ Removing and installing ⇒ “3.5 Removing and installing camshafts”, page 145
- ❑ Mark installation position for re-installation
- ❑ Check roller bearings for ease of movement
- ❑ Lubricate contact surfaces before installing

8 - Hydraulic compensation element

- ❑ With retaining clip
- ❑ Mark installation position for re-installation
- ❑ Lubricate contact surfaces before installing

9 - Valve

- ❑ Must not be machined; only grinding-in is permissible
- ❑ Mark installation position for re-installation
- ❑ Checking ⇒ page 159
- ❑ Valve dimensions ⇒ page 158
- ❑ Checking valve guides ⇒ page 158

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10 - Cylinder head

11 - Valve stem oil seal

- ❑ Renewing: with cylinder head installed ⇒ page 151 , with cylinder head removed ⇒ page 154

12 - Valve spring

13 - Valve spring plate

14 - Valve cotters

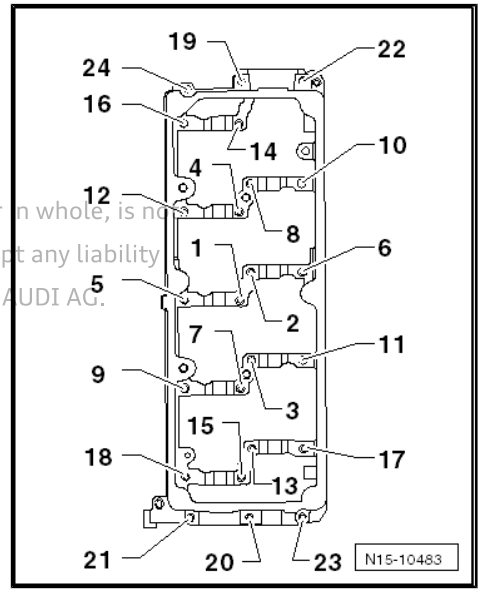
15 - Sealing cap

- ❑ Renew
- ❑ Removing sealing cap with retaining frame installed: pierce on one side with an awl and pry out
- ❑ Installing: drive in without sealant using suitable thrust piece
- ❑ Installation depth 1 ... 2 mm

Retaining frame - tightening torque and sequence

– Tighten bolts and nuts in 2 stages in the sequence shown:

Stage	Bolts/nuts	Tightening torque
1.	-1 … 24-	Screw in by hand until contact is made • The retaining frame should make contact with the cylinder head over the full surface
2.	-1 … 24-	10 Nm

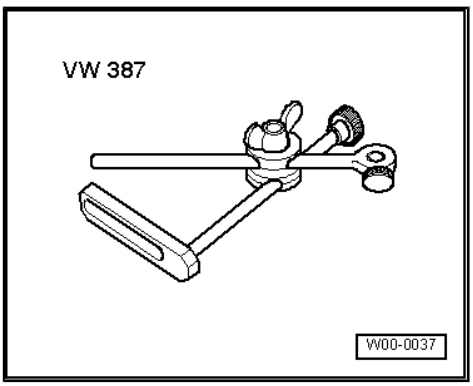


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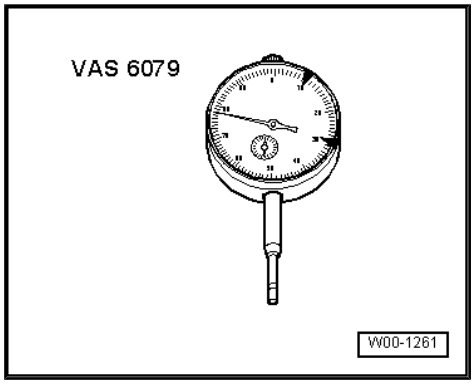
3.2 Measuring axial clearance of camshafts

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



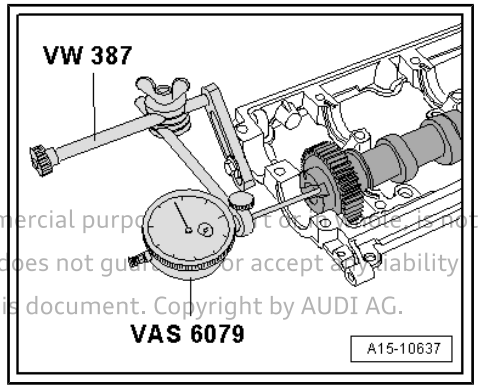
♦ Dial gauge - VAS 6079-



Procedure

– Remove retaining frame
⇒ “3.5 Removing and installing camshafts”, page 145 .

– Secure dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to retaining frame as shown in illustration.



– Press camshaft against dial gauge by hand.

– Set dial gauge to “0”.

– Press camshaft away from dial gauge and read off value:

Axial clearance on inlet camshaft and exhaust camshaft:

• Specification: 0.048 ... 0.118 mm.

• Wear limit: 0.17 mm.

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3.3 Measuring radial clearance of camshafts

Special tools and workshop equipment required

♦ Plastigauge

Procedure

– Remove roller rocker fingers
⇒ “3.5 Removing and installing camshafts”, page 145 .

– Clean bearings and bearing journals.

– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or bearing shell to be measured.

• The Plastigauge must be positioned in the centre of the bearing.

– Fit retaining frame and tighten to 10 Nm without rotating camshafts ⇒ page 141 .

– Remove retaining frame again.

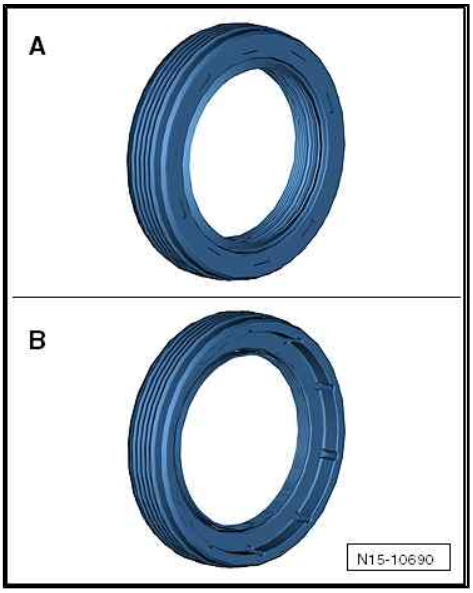
– Compare width of Plastigauge with measurement scale.

• Radial clearance: 0.035 ... 0.085 mm

3.4 Renewing camshaft oil seal

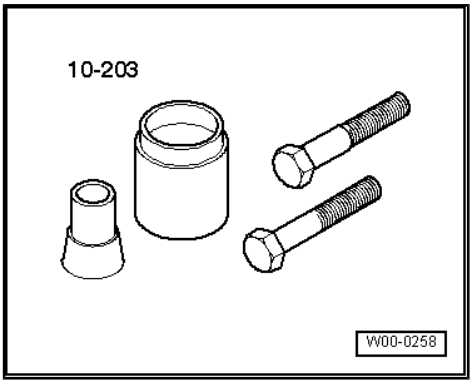
Note

- *A modified oil seal is being phased in.*
- *The “old” version oil seal -item A- forms a continuous surface between the camshaft and the cylinder head.*
- *The “new” version oil seal -item B- has a shoulder between the camshaft and the cylinder head.*

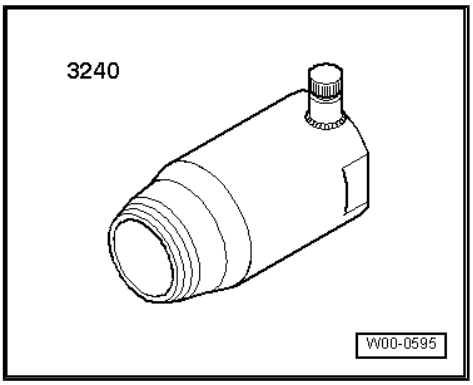


Special tools and workshop equipment required

- Fitting tool - 10 - 203-

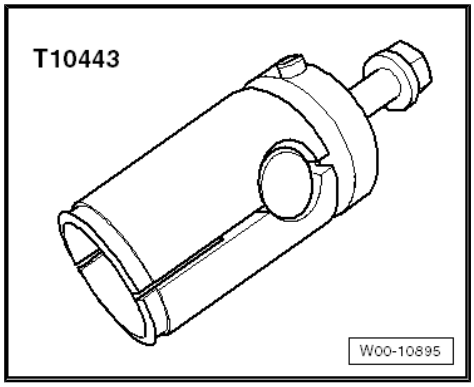


- Oil seal extractor - 3240- for “old” version oil seal



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♦ Puller - T10443- for “new” version oil seal



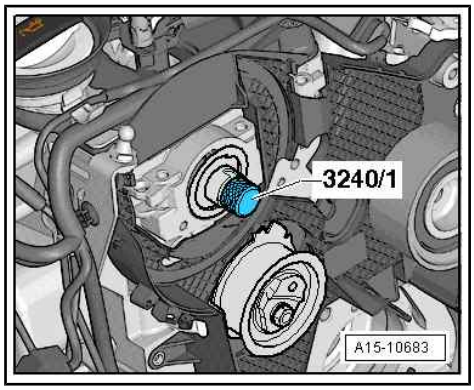
♦ Bolt M12x1.5x75

Procedure

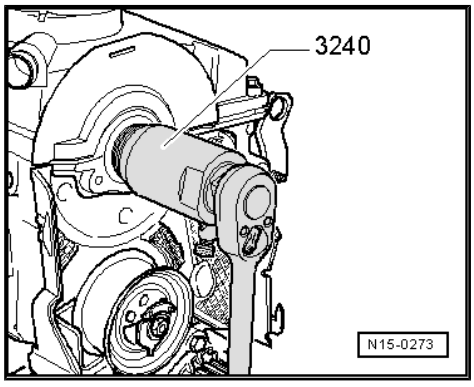
– Remove camshaft sprocket and hub
⇒ “3.5 Removing and installing camshafts”, page 145 .

“Old” version oil seal:

– Insert thrust piece -3240/1- in camshaft.



– Screw inner section of oil seal extractor -3240- two turns out of outer section (approx. 3 mm) and lock with knurled screw.
– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).
– Loosen knurled screw and turn inner section against camshaft until oil seal is pulled out.
– Clamp flats of oil seal extractor in vice and use pliers to remove oil seal.

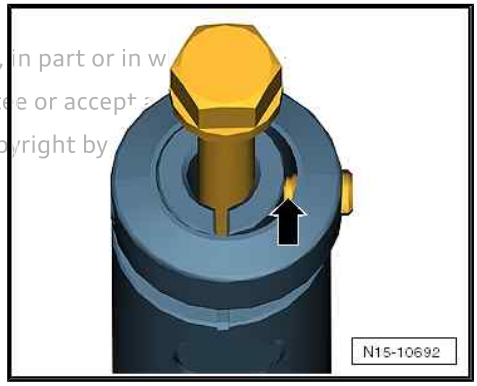


“New” version oil seal:

Caution

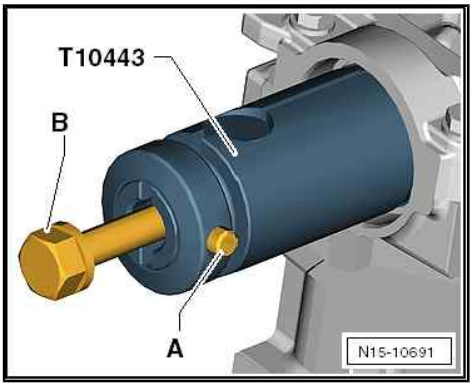
♦ ***If the grub screw is unscrewed too far the thrust plate inside the puller -T10443- will come loose from the thrust bolt. If this happens, the thrust plate must be pushed back onto the thrust bolt.***

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– Carefully unscrew grub screw -arrow- of puller -T10443- until slight resistance is felt.

– Apply puller - T10443- in a straight line, as shown in illustration, and lock by screwing in grub screw.-A-.
– Screw in thrust bolt -B- until oil seal is pulled out.



All types of oil seal (continued):

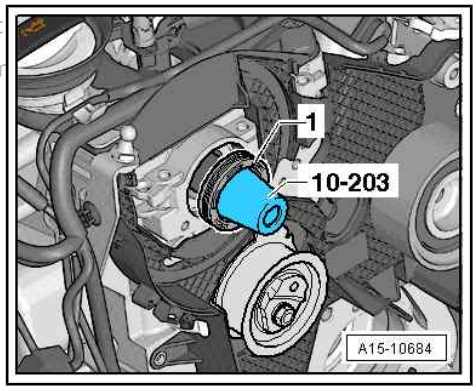
– Clean contact surface and sealing surface.

Note

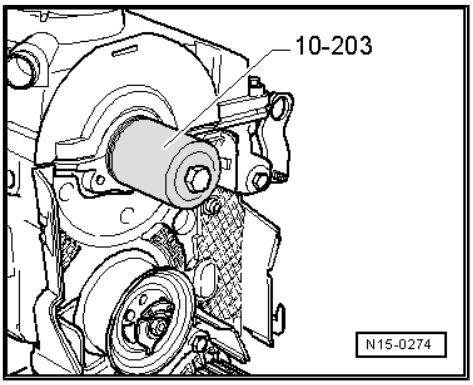
The sealing lip of the oil seal must not be additionally oiled or greased.

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– Apply guide sleeve of fitting tool - 10 - 203- to camshaft as shown in illustration.
– Carefully push oil seal -1- over guide sleeve and onto camshaft.

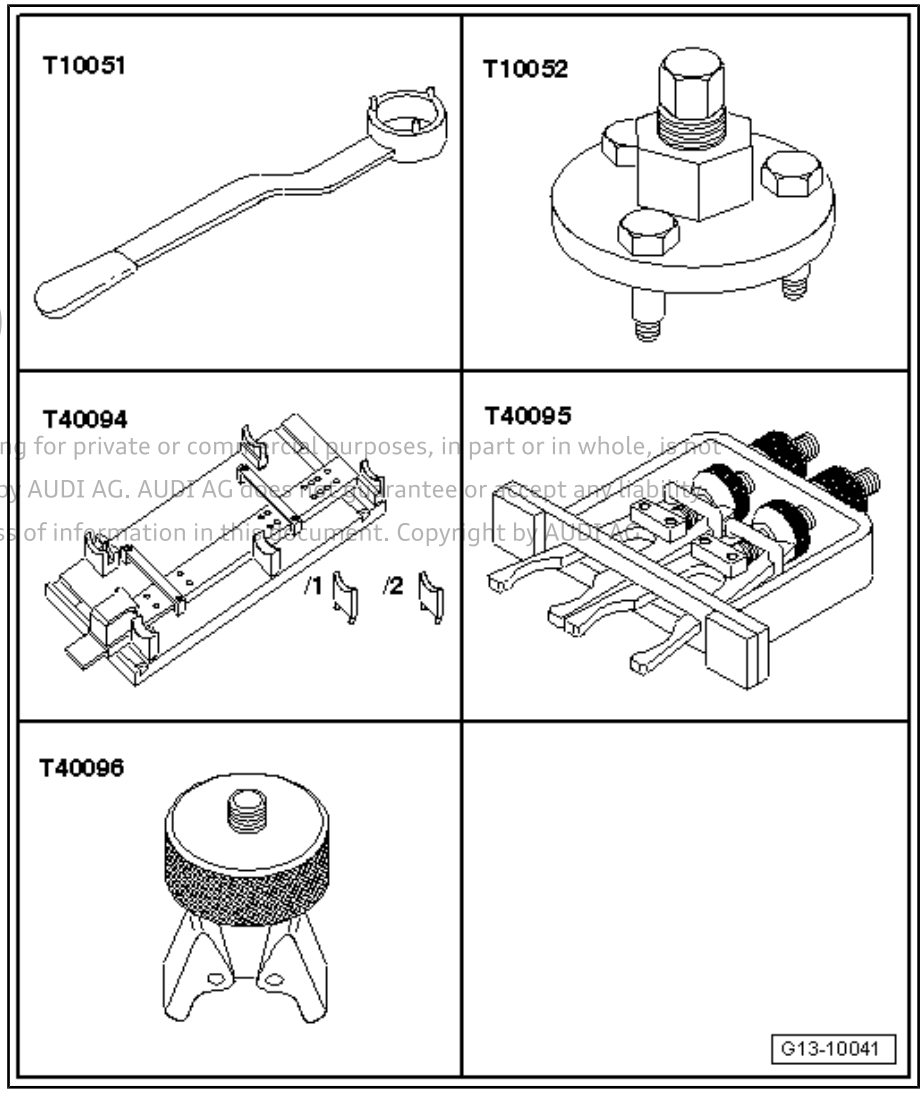


– Press in oil seal onto stop using thrust piece of fitting tool - 10 - 203- and bolt M12×1.5×75.
– Install camshaft sprocket and hub ⇒ “3.5 Removing and installing camshafts”, page 145 .
– Install toothed belt (adjust valve timing) ⇒ page 110 .



3.5 Removing and installing camshafts

Special tools and workshop equipment required



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- Counterhold tool - T10051-
- Puller - T10052-
- Camshaft fitting tool - T40094-
- Camshaft fitting tool - T40095-
- Clamping tool -T40096/1- for vehicles with two-piece camshaft gear
- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

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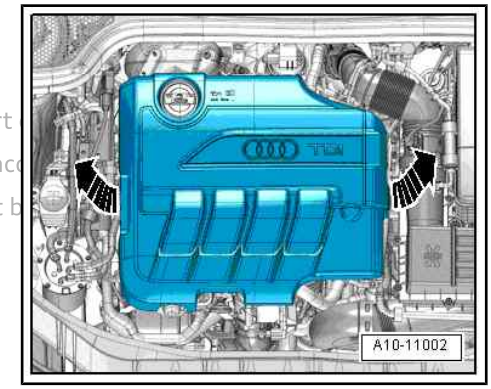
Removing

- Cylinder head installed.

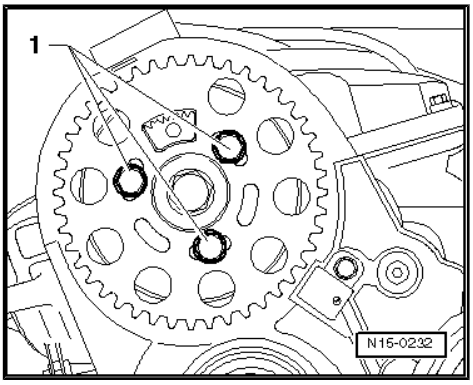
– Remove engine cover panel -arrows-.

– Take toothed belt off camshaft sprocket and high-pressure pump sprocket ⇒ page 103 .

– Remove cylinder head cover ⇒ page 119 .

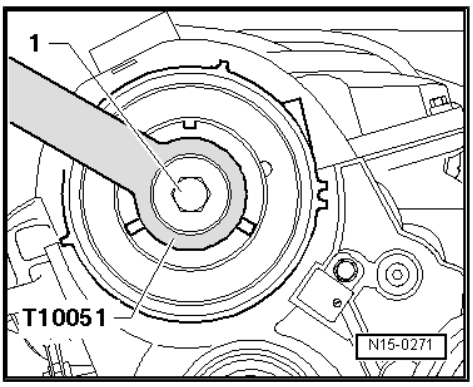


– Remove bolts -1- and detach camshaft sprocket.



– Counterhold using counterhold tool - T10051- and loosen bolt -1- for camshaft hub.

– Unscrew bolt approx. 2 turns.

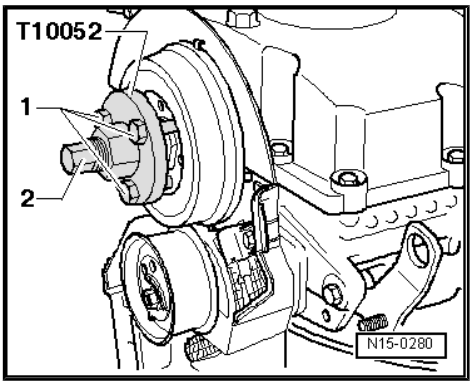


– Apply puller - T10052- to camshaft hub and screw bolts -1- into hub.

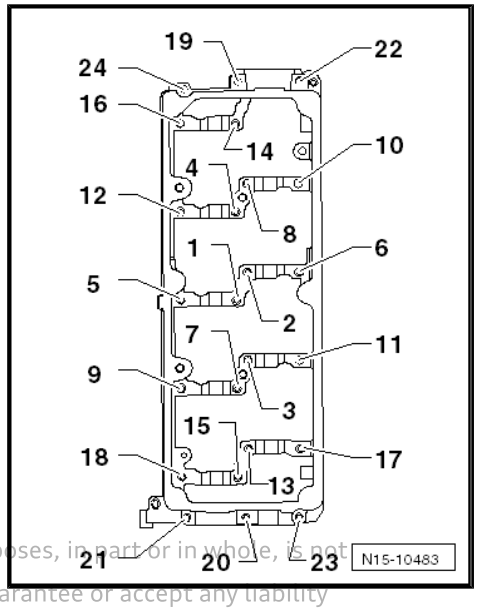
– Counterhold on hexagon flats (30 mm) of puller and screw in bolt -2- to pull off camshaft hub.

– Detach hub from taper of camshaft.

– Remove vacuum pump ⇒ Rep. gr. 47 .



– Slacken retaining frame bolts and nuts in the sequence -24 ... 1-.
– Remove bolts and carefully release retaining frame from bonded joint.
– Mark fitting location of camshafts for re-installation and remove.



Installing

Tightening torque

◆ ⇒ “3.1 Exploded view - valve gear”, page 139

Caution

Make sure axial bearings in retaining frame are not damaged.

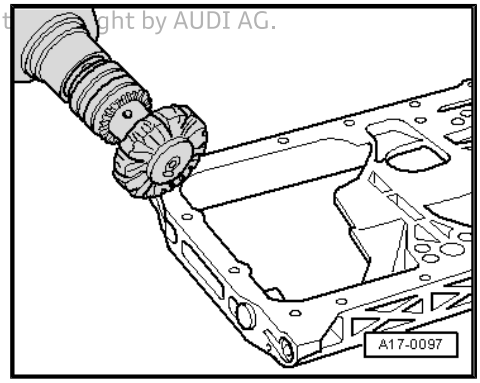
◆ *The camshafts MUST be installed using the camshaft fitting tool - T40094- as described in the following.*

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Caution

Protect lubrication system and bearings against contamination.

◆ *Cover exposed parts of the engine.*



WARNING

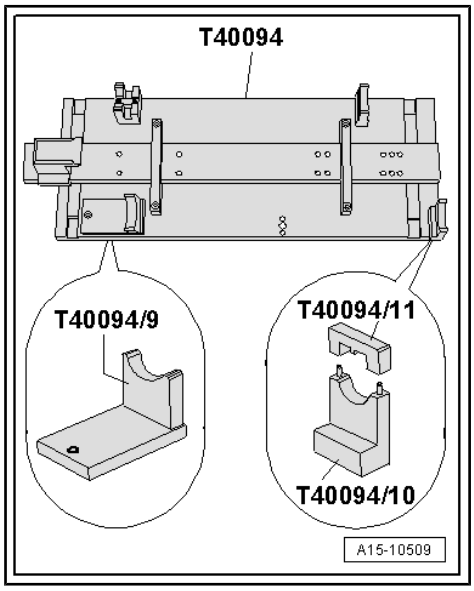
Risk of eye injury.

◆ *Put on safety goggles.*

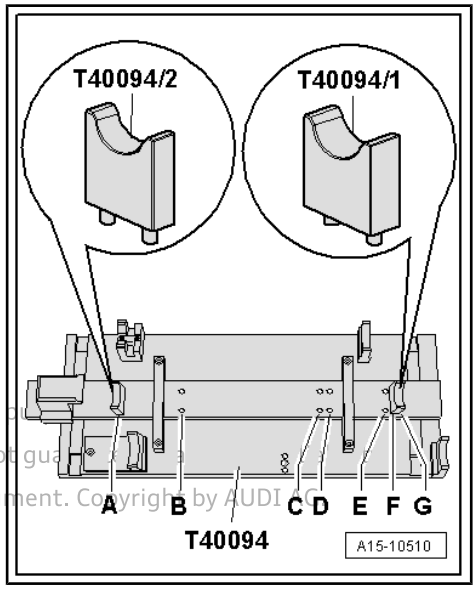
– Remove remaining sealant from cylinder head and retaining frame using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.
– Oil running surfaces of both camshafts.

Set up camshaft fitting tool - T40094- as follows:

– Secure supports -T40094/9- and -T40094/10- (with -T40094/11-) to base plate, as shown in illustration. If necessary, remove any supports already attached at these positions.

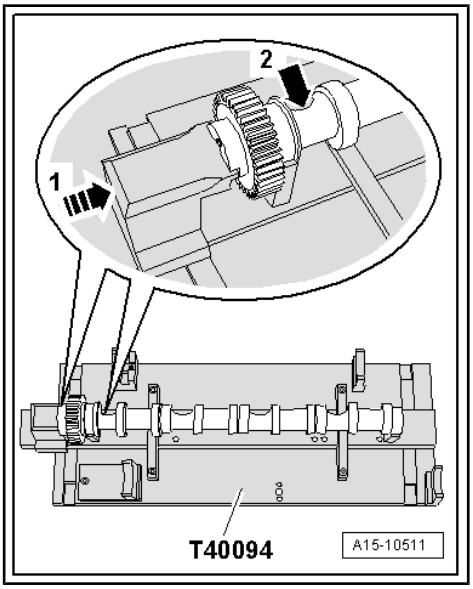


– Fit support -T40094/1- onto position -F- and support -T40094/2- onto position -A-.



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– Place inlet camshaft in supports -T40094/1- and -T40094/2- .
– Turn inlet camshaft in such a way that it can be locked in “TDC” position using locking device -arrow 1-.
• Recess -arrow 2- for cylinder head bolt must face outwards.



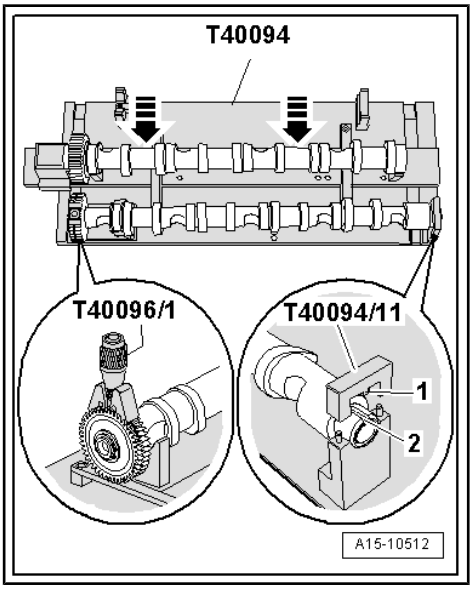
– Place exhaust camshaft in supports -T40094/9- and -T40094/10- .
– Lock exhaust camshaft with top section -T40094/11- .
• The lug -1- on the top section must engage in the slot -2- in the camshaft,

Vehicles with two-piece camshaft gear:

– Place clamping tool -T40096/1- on teeth of exhaust camshaft in such a way that the two arms of the tool engage on the two halves of the gear (one in each half, as shown in illustration).
• The wider arm must engage in the wider half of the gear.
– Tighten the clamping tool using the knurled wheel so that the faces of the gear teeth are in alignment.

All vehicles (continued):

– Slide inlet camshaft towards exhaust camshaft, until gear teeth engage -arrows-.

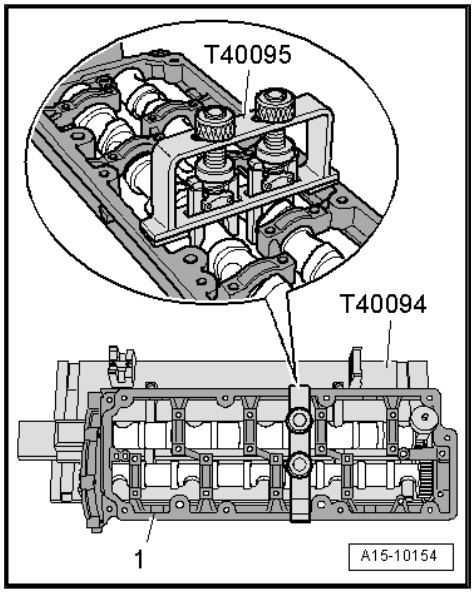


– Fit retaining frame on camshafts.

• All camshaft bearings must be seated on the camshafts.

– Position camshaft fitting tool - T40095- and fix camshafts in position in retaining frame, as shown in illustration.

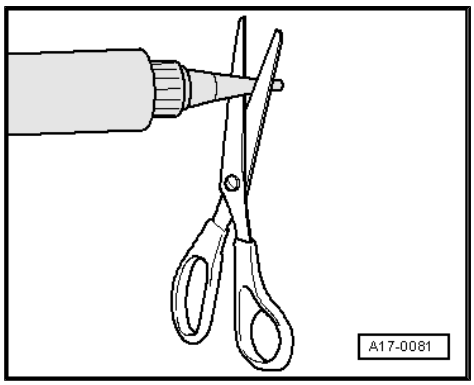
– Detach top section -T40094/11- .



Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



Caution

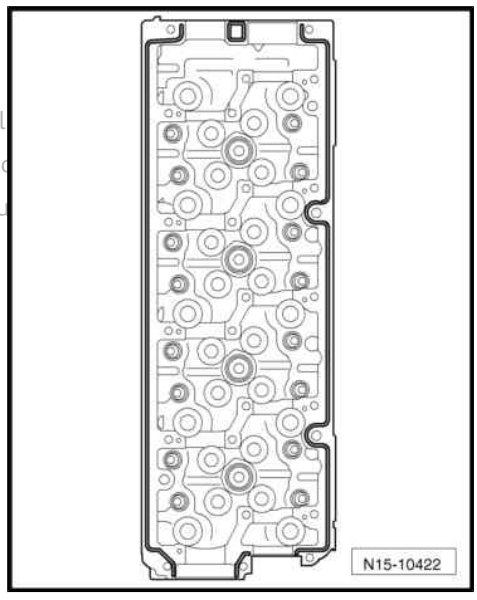
Make sure excess sealant does not contaminate camshaft bearings.

♦ ***The sealant beads must not be thicker than specified.***

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– Apply beads of sealant onto clean sealing surfaces of cylinder head as shown in illustration.

• Thickness of sealant beads: 2 ... 3 mm



Note

♦ *The retaining frame should be fitted and secured without delay, as the sealant starts hardening immediately.*

♦ *After installing the retaining frame, wait about 30 minutes for the sealant to dry.*

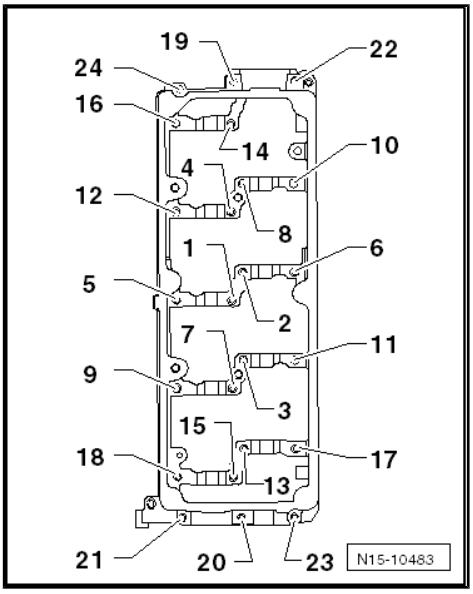
– Take camshafts together with retaining frame, camshaft fitting tool - T40095- and, if necessary, clamping tool -T40096/1- out of camshaft fitting tool - T40094- and insert components carefully into cylinder head.

– Screw in retaining frame bolts and nuts in the sequence -1 ... 24- evenly by hand until they make contact.

• The retaining frame should make contact with the cylinder head over the full surface.

– Tighten bolts and nuts ⇒ page 141 .

– Remove camshaft fitting tool - T40095- and, if necessary, clamping tool -T40096/1- .



Remaining installation steps are carried out in reverse sequence; note the following:

– Install camshaft oil seal ⇒ page 143 .

– Drive new sealing cap ⇒ Item 15 (page 141) into cylinder head to a depth of approx. 1 ... 2 mm using suitable thrust piece.

– Install vacuum pump ⇒ Rep. gr. 47 .

– Install cylinder head cover ⇒ page 119 .

Caution

Risk of damage to valves and piston crowns after working on valve gear.

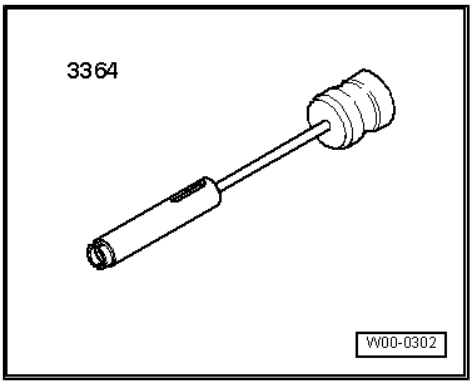
- ***The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.***
- ***Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.***

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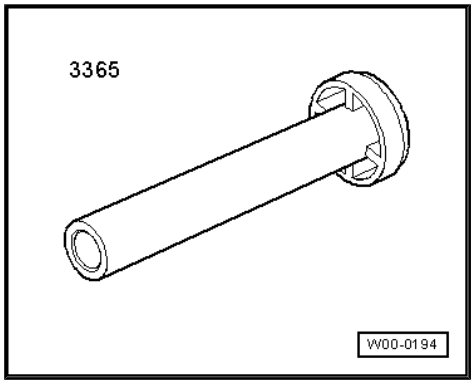
3.6 Renewing valve stem oil seals with cylinder head installed

Special tools and workshop equipment required

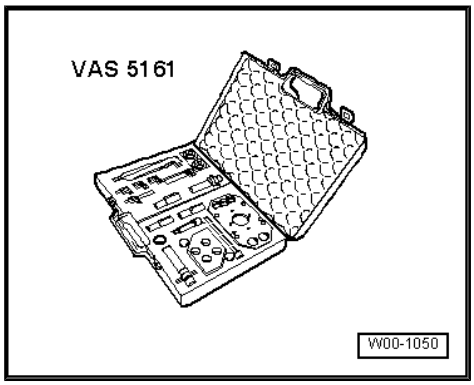
- Valve stem seal puller - 3364-



- Valve stem oil seal fitting tool - 3365-



- Removal and installation device for valve cotters - VAS 5161- with guide plate for 3.0 ltr. TDI engine - VAS 5161/23- and sleeve -VAS 5161/23-1-



- M6 nut without collar (2x)

Procedure

– Remove all glow plugs ⇒ Rep. gr. 28 .

– Remove camshafts ⇒ page 145 .

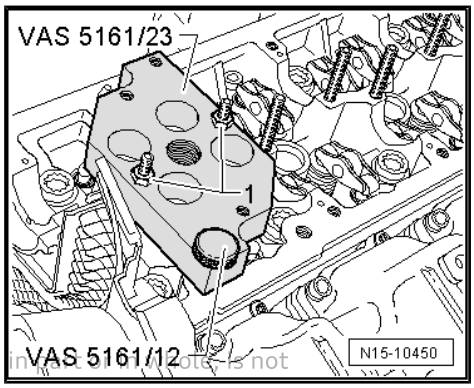
– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

– Set piston of appropriate cylinder to “bottom dead centre”.

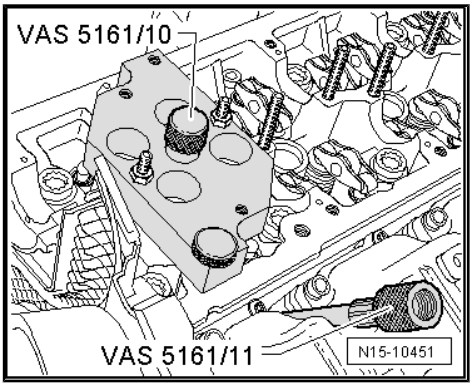
– Fit guide plate for 3.0 ltr. TDI engine - VAS 5161/23- onto cylinder head.

– Secure guide plate on intake manifold side with knurled screw -VAS 5161/12- and at studs by screwing on 2 M6 nuts without collar -item 1- by hand until they make contact.

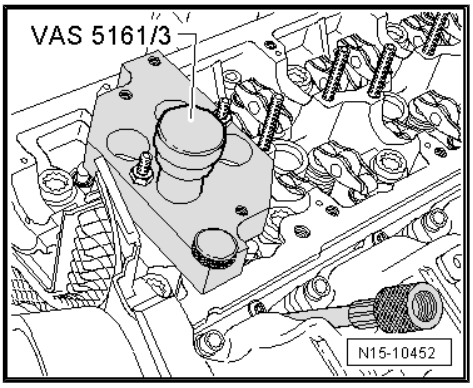


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– Screw sealing pin -VAS 5161/10- into guide plate.
– Screw adapter -VAS 5161/11- hand-tight into corresponding glow plug thread.



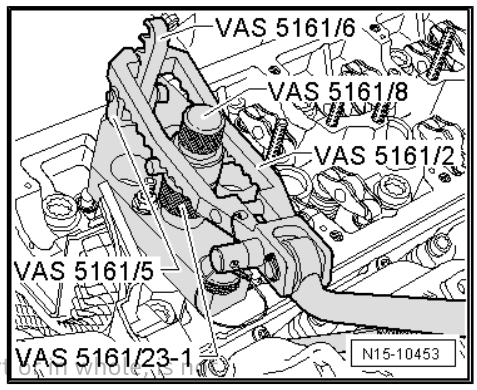
– Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Slide sleeve -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8- .
– Connect adapter to compressed air line using a commercially available connection piece and apply constant air pressure.

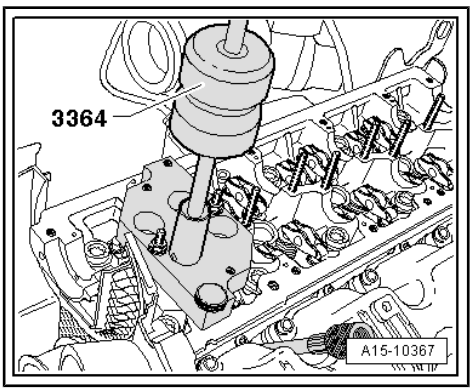
• Minimum pressure: 6 bar

– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.



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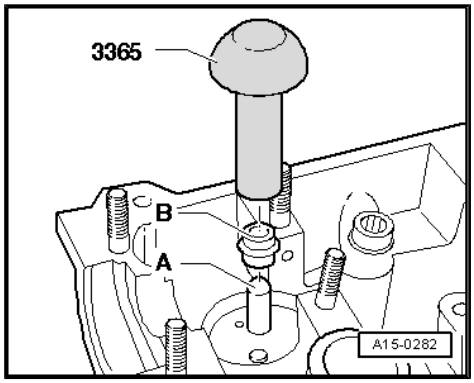
– Release pressure fork.
– Take off assembly cartridge with sleeve.
– Detach valve spring with valve spring plate.
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

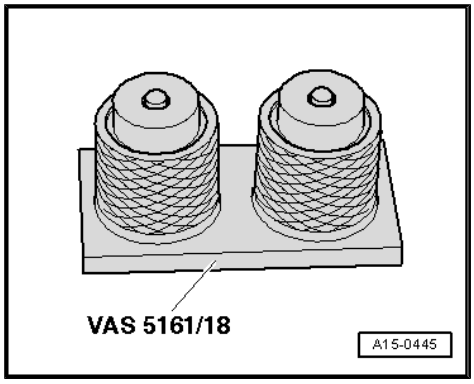
Make sure valve stem oil seals are not damaged when installing.

- *New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.*

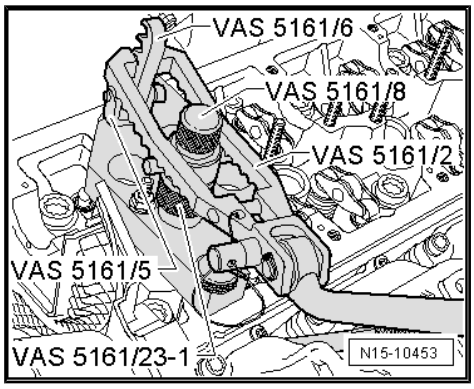


– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .



• Larger diameter of valve cotters faces upwards.
– Insert valve spring and valve spring plate.
– Press assembly cartridge onto insertion device from above and take up valve cotters.



– Insert assembly cartridge in guide plate for 3.0 ltr. TDI engine - VAS 5161/23- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.

Assembling

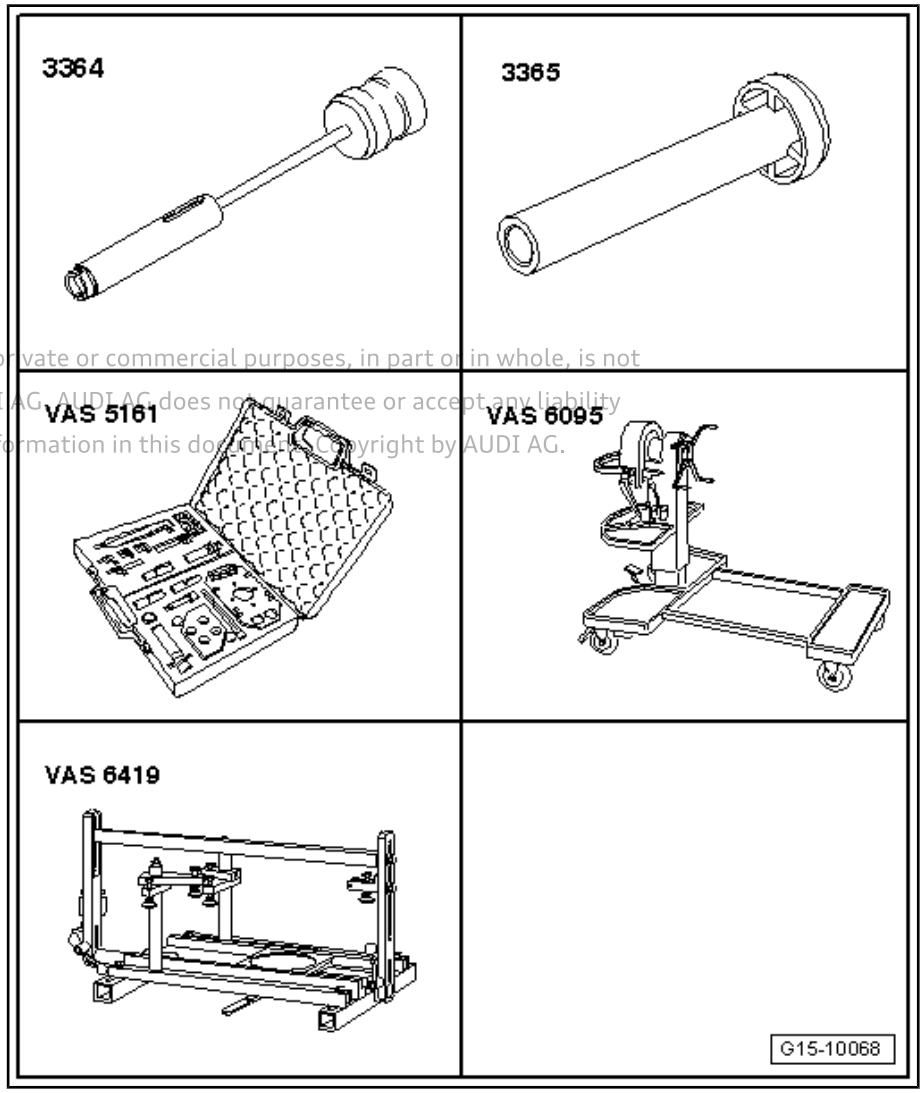
Installation is carried out in the reverse order; note the following:

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install camshafts ⇒ page 145 .
– Install glow plugs ⇒ Rep. gr. 28 .

3.7 Renewing valve stem oil seals with cylinder head removed

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Special tools and workshop equipment required



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- Valve stem seal puller - 3364-
- Valve stem oil seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161- with guide plate for 3.0 ltr. TDI engine - VAS 5161/23- and sleeve -VAS 5161/23-1-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-
- M6 nut without collar (2x)

Procedure

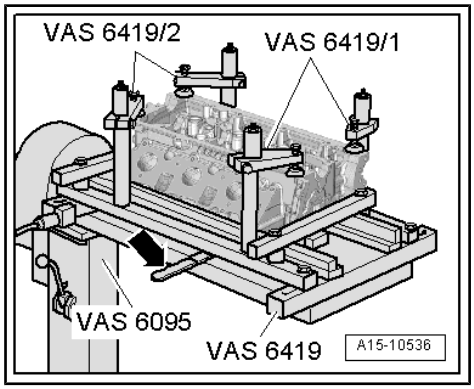
– Remove camshafts ⇒ page 145 .

– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

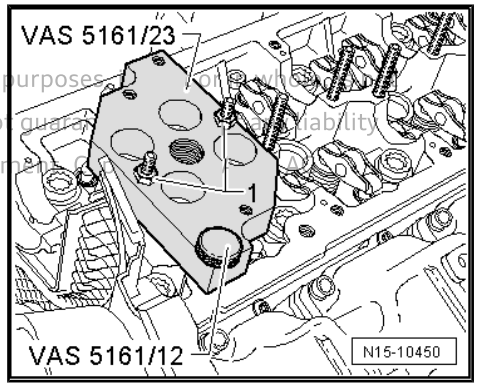
– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .

– Secure cylinder head in cylinder head tensioning device, as shown in illustration.
– Connect cylinder head tensioning device to compressed air supply.
– Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
– Apply just enough compressed air to bring air pad into contact with valve heads.

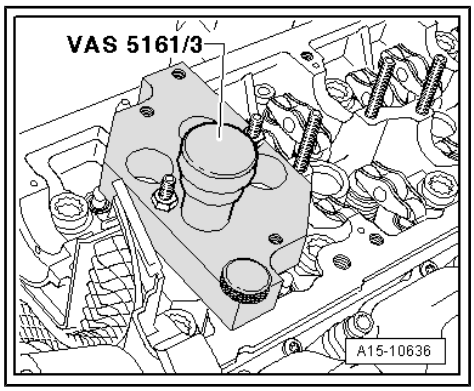


– Fit guide plate for 3.0 ltr. TDI engine - VAS 5161/23- onto cylinder head.
– Secure guide plate on intake manifold side with knurled screw -VAS 5161/12- and at studs by screwing on 2 M6 nuts without collar -item 1- by hand until they make contact.

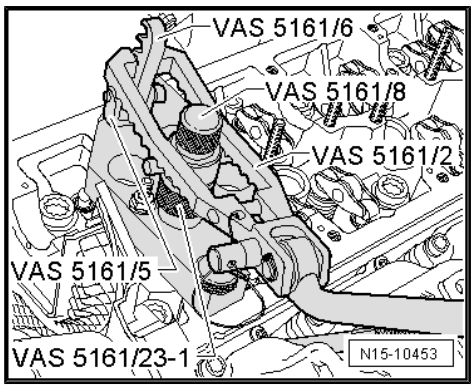
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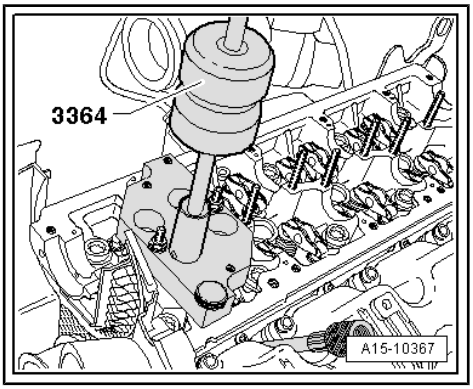
– Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



– Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
– Slide sleeve -VAS 5161/23-1- onto assembly cartridge -VAS 5161/8- .
– Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
– At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
– Release pressure fork.
– Take off assembly cartridge with sleeve.
– Detach valve spring with valve spring plate.



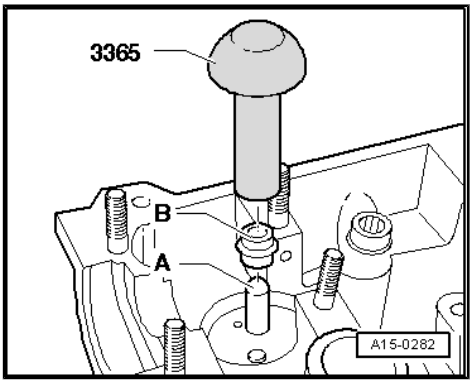
– Pull off valve stem oil seal with valve stem seal puller - 3364- .



Caution

Make sure valve stem oil seals are not damaged when installing.

- ***New valve stem oil seals -B- are supplied with plastic sleeve; fit plastic sleeve -A- onto valve stem.***

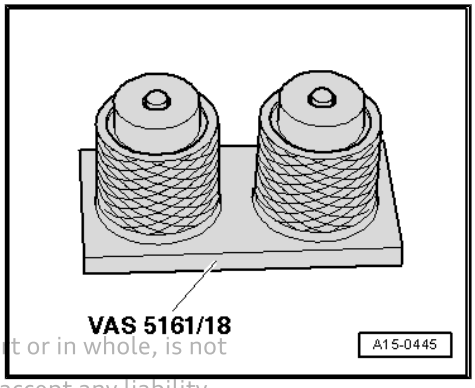


– Lightly oil sealing lip of valve stem oil seal.
– Slide valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
– Take off plastic sleeve.

If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

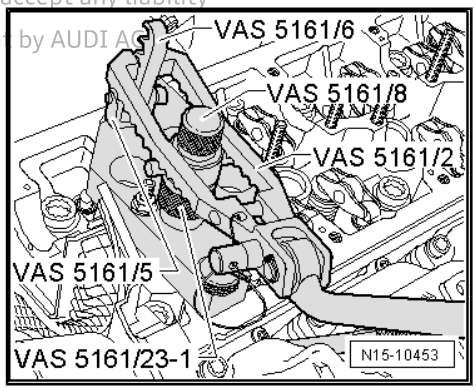
• Larger diameter of valve cotters faces upwards.

– Insert valve spring and valve spring plate.
– Press assembly cartridge onto insertion device from above and take up valve cotters.



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– Insert assembly cartridge in guide plate for 3.0 ltr. TDI engine - VAS 5161/23- again.
– Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
– Release pressure fork with knurled screw still in pulled position.
– Repeat procedure for each valve.

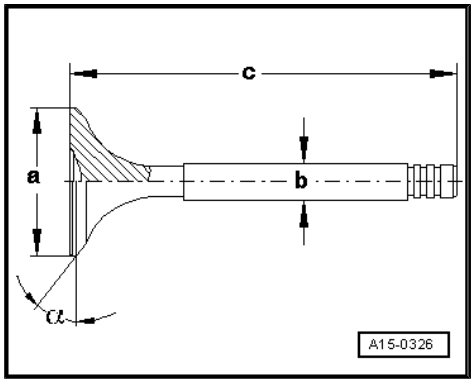


Assembling

Installation is carried out in the reverse order; note the following:

– Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.
– Install camshafts ⇒ page 145 .

3.8 Valve dimensions



Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

Dimension		Inlet valve	Exhaust valve
∅ a	mm	28.10	26.00
∅ b	mm	5.975	5.965
c	mm	99.30	99.10
α	∠°	45	45

3.9 Machining valve seats

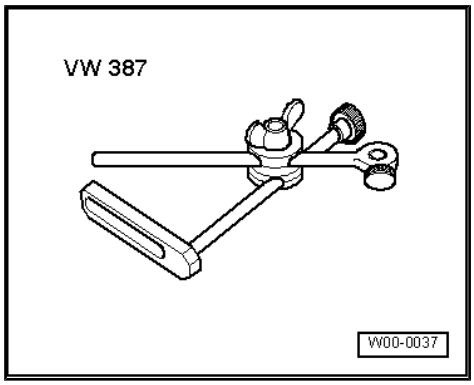
Note

Valve seats may not be machined due to the very small tolerances.

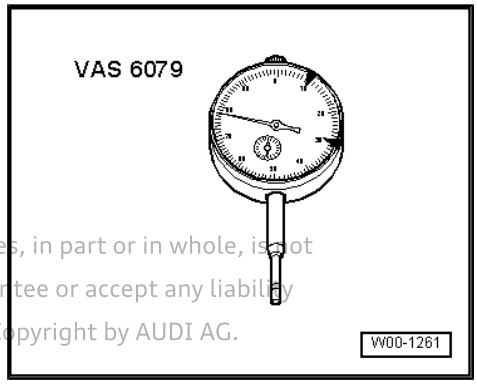
3.10 Checking valve guides

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



- Dial gauge - VAS 6079-



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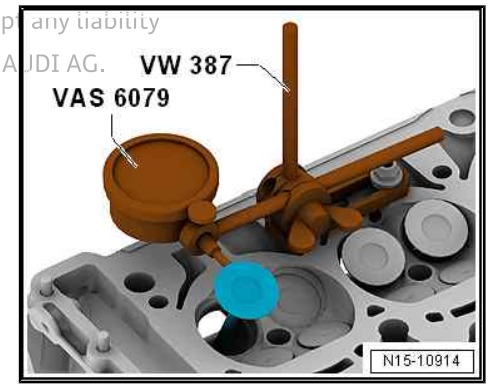
Procedure

Note

- *If the valve has to be renewed as part of a repair, use a new valve for the measurement.*
- *Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.*

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– Attach dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to cylinder head.



– Insert valve into guide.
• End of valve stem must be flush with guide.
– Measure the amount of sideways play.
• Wear limit: 1.0 mm.
– If the wear limit is exceeded, repeat the measurement with new valves.
– Renew cylinder head if wear limit is still exceeded.

Note

Valve guides cannot be renewed.

3.11 Checking valves

– Visually inspect for scoring on valve stems and valve seat surfaces.
– Renew valve if scoring is clearly visible.

17 – Lubrication

1 Oil pump, sump, balance shaft assembly

Overview

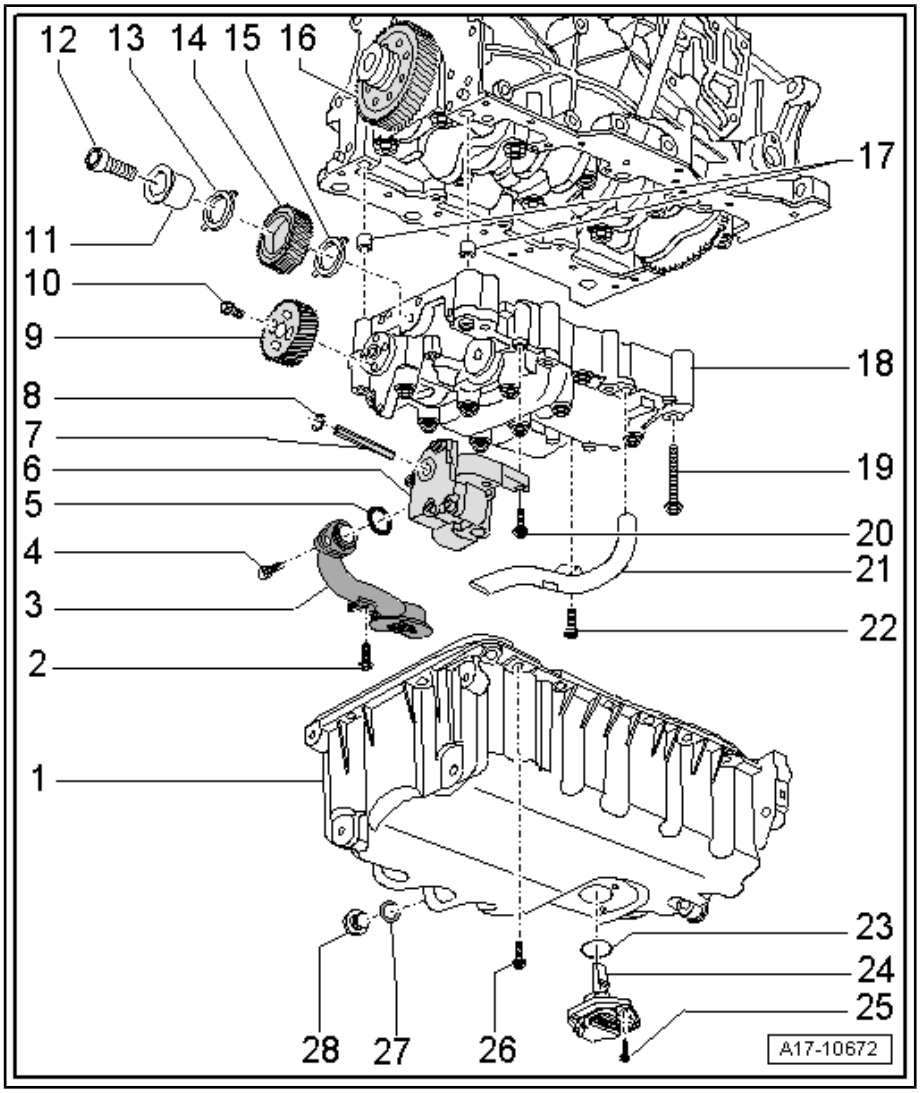
- ⇒ “1.1 Exploded view - oil pump, sump, balance shaft assembly”, page 160
- ⇒ “1.2 Removing and installing oil level and oil temperature sender G266 ”, page 164
- ⇒ “1.3 Removing and installing sump”, page 165
- ⇒ “1.4 Removing and installing oil pump”, page 169
- ⇒ “1.5 Removing balance shaft assembly”, page 170
- ⇒ “1.6 Installing a new balance shaft assembly”, page 172
- ⇒ “1.7 Re-installing a used balance shaft assembly”, page 175

Note

- *If large quantities of metal shavings or abrasion are found when performing engine repairs, this may be an indication of damage to the crankshaft or conrod bearings. To prevent further damage, the following steps are required after completion of repair work: clean the oil passages carefully and renew the oil spray jets, engine oil cooler and oil filter.*
- *Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .*
- *Oil spray jet and pressure relief valve ⇒ page 97*

1.1 Exploded view - oil pump, sump, balance shaft assembly

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1 - Sump

- ❑ Removing and installing ⇒ page 165

2 - Bolt

- ❑ 20 Nm

3 - Suction pipe

- ❑ Clean strainer if dirty

4 - Bolt

- ❑ 9 Nm

5 - O-ring

- ❑ Renew

6 - Oil pump

- ❑ Removing and installing ⇒ page 169
- ❑ Before installing, check that the two dowel sleeves for centring oil pump are fitted onto balance shaft assembly

7 - Oil pump drive shaft

8 - Circlip

- ❑ Must fit securely in groove
- ❑ Renew circlip if damaged or stretched

9 - Spur gear for balance shaft

10 - Bolt

- ❑ Renew
- ❑ 20 Nm +90°

11 - Hub

- ❑ For idler gear
- ❑ Renew

12 - Bolt

- ❑ Renew
- ❑ If the bolt for the idler gear has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation ⇒ “1.6 Installing a new balance shaft assembly”, page 172
- ❑ 90 Nm +90°

13 - Thrust washer

- ❑ Fitted on some vehicle versions only; refer to ⇒ Electronic parts catalogue (ETKA)
- ❑ For idler gear
- ❑ Renew

14 - Idler gear

- ❑ For balance shaft assembly
- ❑ If the bolt for the idler gear has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation ⇒ “1.6 Installing a new balance shaft assembly”, page 172
- ❑ To achieve the correct backlash a suitably thick coating is already applied to the new idler gear; the required clearance is achieved as the coating is worn down
- ❑ Installation position: Part No. must be visible.
- ❑ Make sure thrust washer -item 15- is properly seated ⇒ page 163

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15 - Thrust washer

- ❑ For idler gear
- ❑ Renew
- ❑ Installation position ⇒ page 163
- ❑ When installing idler gear, apply grease to hold washer on balance shaft assembly

16 - Spur gear

- ❑ Pulling spur gear off crankshaft and shrink-fitting new spur gear ⇒ page 90

17 - Dowel sleeves

- ❑ For centring balance shaft assembly on cylinder block

18 - Balance shaft assembly

- ❑ Removing ⇒ page 170
- ❑ Before installing, check that the two dowel sleeves for centring balance shaft assembly are fitted on cylinder block
- ❑ Installing new balance shaft assembly ⇒ page 172
- ❑ Re-installing "old" balance shaft assembly ⇒ page 175

19 - Bolt

- ❑ Renew
- ❑ Tightening torque and sequence for balance shaft assembly with eight attachment points ⇒ page 163
- ❑ Tightening torque and sequence for balance shaft assembly with six attachment points ⇒ page 164

20 - Bolt

- ❑ 9 Nm

21 - Oil intake pipe

22 - Bolt

- ❑ 9 Nm

23 - Seal

- ❑ Renew

24 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 164

25 - Bolt

- ❑ Self-locking
- ❑ Renew
- ❑ 9 Nm

26 - Bolt

- ❑ Tightening torque and sequence ⇒ page 163

27 - Seal

- ❑ Renew

28 - Oil drain plug

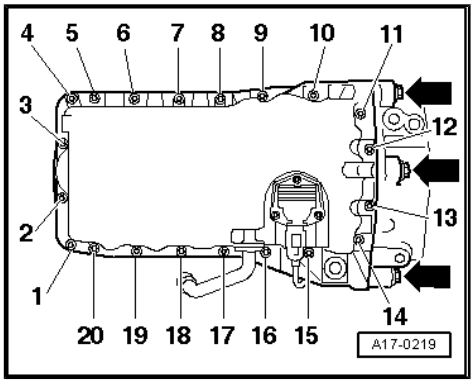
- ❑ 30 Nm

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Sump - tightening torque and sequence

– Tighten bolts in 3 stages as follows:

Stage	Bolts	Tightening torque
1.	-1 … 20-	5 Nm in diagonal sequence
2.	-Arrows-	40 Nm
3.	-1 … 20-	Tighten in stages and in diagonal sequence; final torque 15 Nm

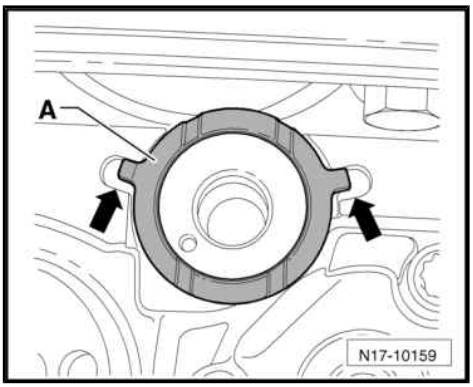


Installation position of thrust washer

Caution

Thrust washer can slip out of position behind idler gear.

- *Make sure that thrust washer -A- does not slip out of the recesses in the balance shaft assembly -arrows- when fitting the idler gear. If this is neglected, the thrust washer can become trapped. If necessary, apply grease to hold washer on balance shaft assembly.*

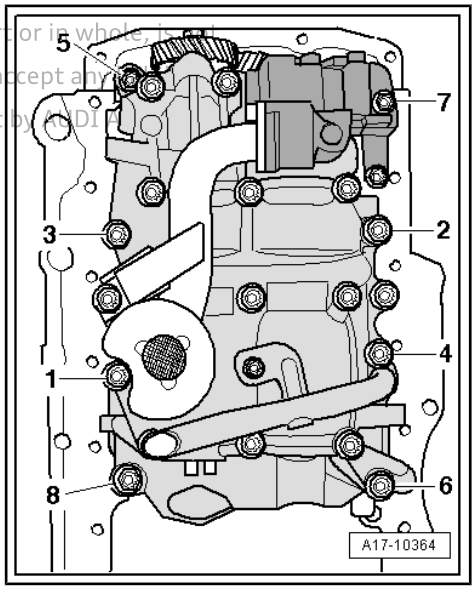


Tightening sequence - balance shaft assembly with eight attachment points

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– Tighten bolts securing balance shaft assembly as follows:

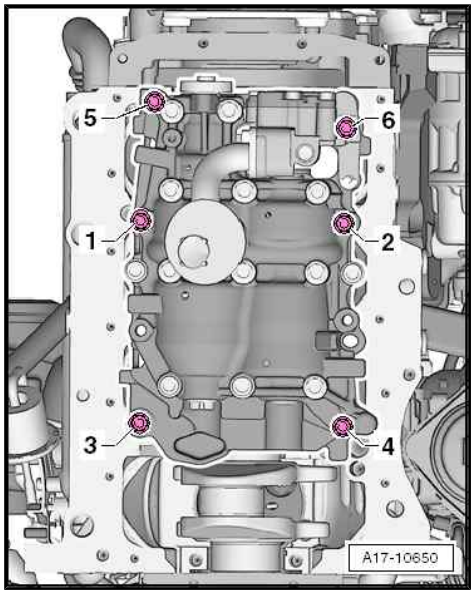
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in hand-tight in this sequence
2.	-1 … 8-	Pre-tighten in this sequence to 6 Nm
3.	-1 … 4-	Tighten to 20 Nm
4.	-5-	Tighten to 13 Nm
5.	-6-	Tighten to 20 Nm
6.	-7-	Tighten to 13 Nm
7.	-8-	Tighten to 20 Nm
8.	-1 … 8-	Use rigid wrench to turn 90° further in this sequence



Tightening sequence - balance shaft assembly with six attachment points

– Tighten bolts securing balance shaft assembly as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 6-	Screw in hand-tight in this sequence
2.	-1 … 6-	Pre-tighten bolts in this sequence to 6 Nm
3.	-1 … 4-	Tighten to 20 Nm
4.	-5 and 6-	Tighten to 13 Nm
5.	-1 … 6-	Use rigid wrench to turn 90° further in this sequence

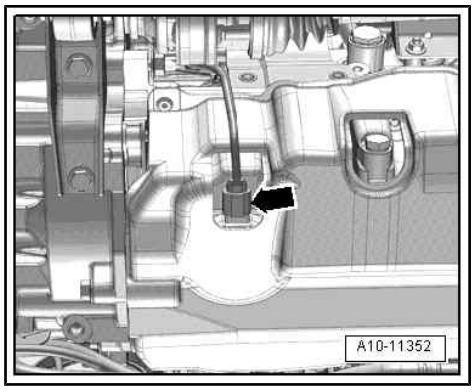


1.2 Removing and installing oil level and oil temperature sender - G266-

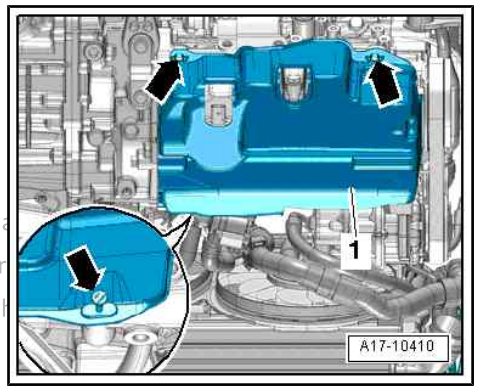
Removing

– Drain off engine oil ⇒ Maintenance ; Booklet 808 .

– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266- .

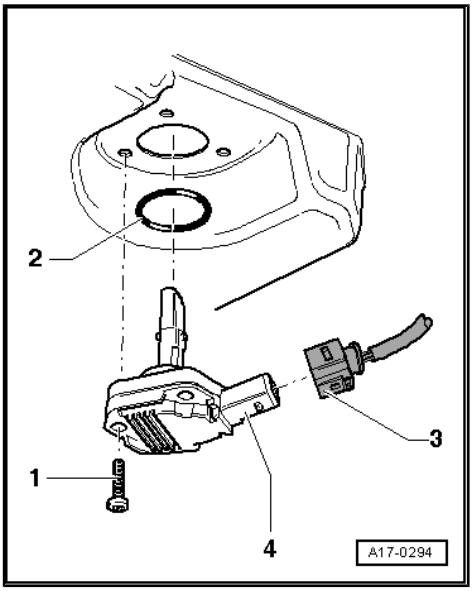


– Release fasteners -arrows- and remove noise insulation -1- for sump.



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– Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 4-.



Note

Disregard -item 3-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “1.1 Exploded view - oil pump, sump, balance shaft assembly”, page 160

Note

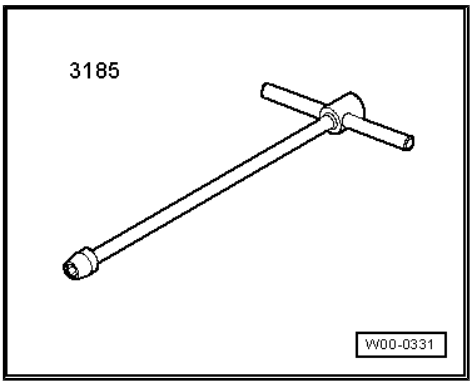
Renew seal -2- and self-locking bolts -1-.

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

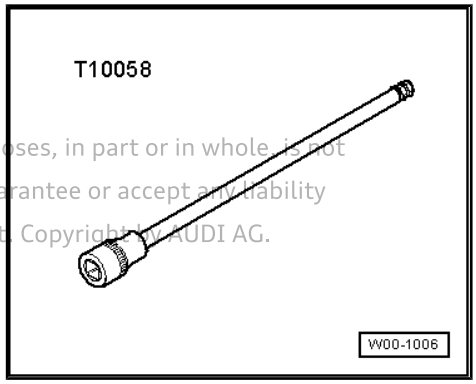
1.3 Removing and installing sump

Special tools and workshop equipment required

♦ Articulated wrench, 10 mm - 3185-



♦ Socket - T10058-



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♦ Electric drill with plastic brush

♦ Sealant ⇒ Electronic parts catalogue

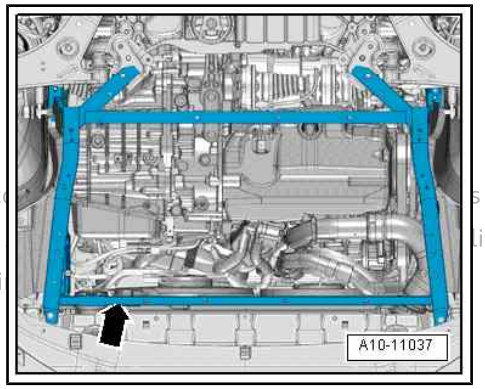
♦ Safety goggles

Removing

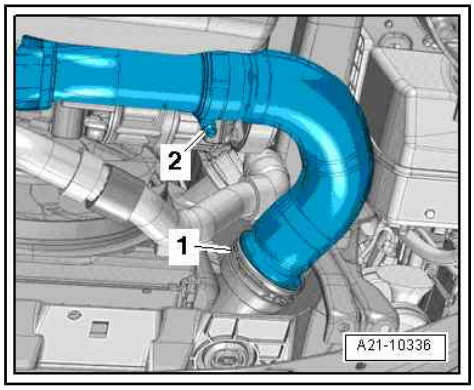
– Drain off engine oil ⇒ Maintenance ; Booklet 808 .

– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .

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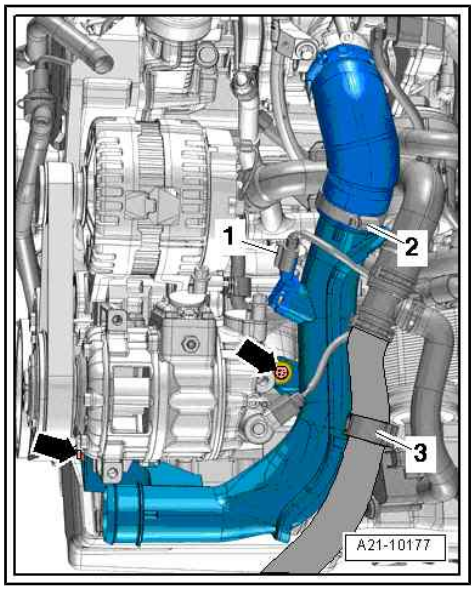
– Release hose clip -2-, lift retaining clip -1- and remove air hose.



WARNING

Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***



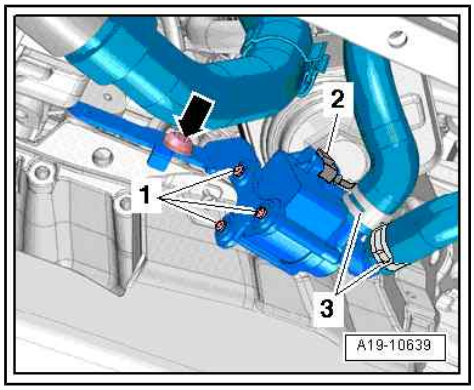
– Remove bolts -arrows-.

– Move coolant hose -3- clear.

– Release hose clip -2-.

– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe.

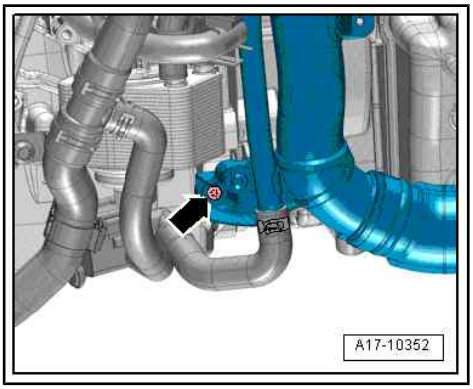
– Remove bolt -arrow- and push pump for exhaust gas recirculation cooler - V400- to the side.



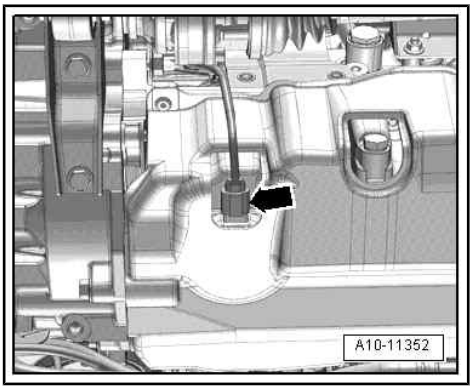
Note

Disregard -items 1, 2, 3-.

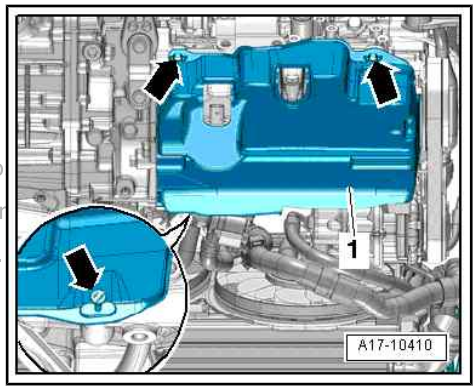
– Remove bolt -arrow- at air pipe (left-side).



– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266- .

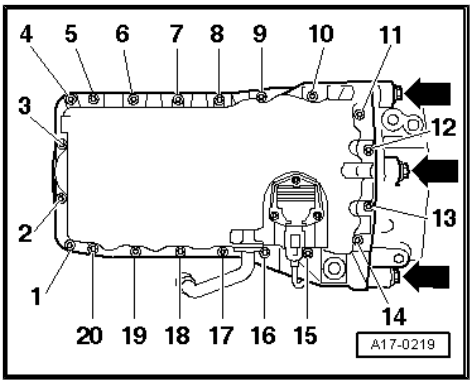


– Release fasteners -arrows- and remove noise insulation -1- for sump.



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– Remove bolts securing sump to gearbox -arrows-.
– Slacken bolts -1 ... 20- in diagonal sequence and remove.
– Carefully release sump from bonded joint.



Installing

Caution

Protect lubrication system and bearings against contamination.

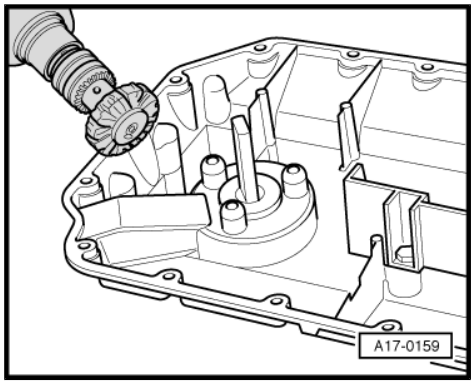
- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

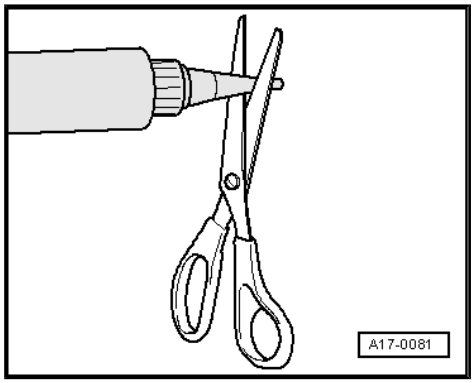
– Remove sealant residue from sump and cylinder block using rotating plastic brush or similar.
– Clean sealing surfaces; they must be free of oil and grease.



Note

Note the use-by date of the sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2 mm).



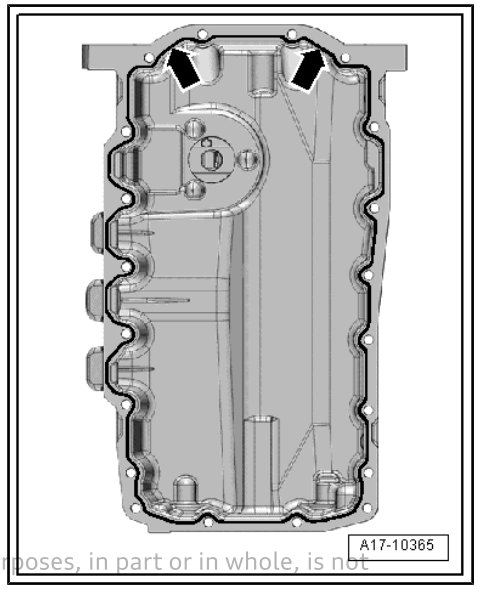
Caution

Make sure lubrication system is not clogged by excess sealant.

- ***The sealant bead must not be thicker than specified.***

– Apply sealant bead onto clean sealing surface of sump as illustrated.

• Thickness of sealant bead: 2 ... 3 mm.



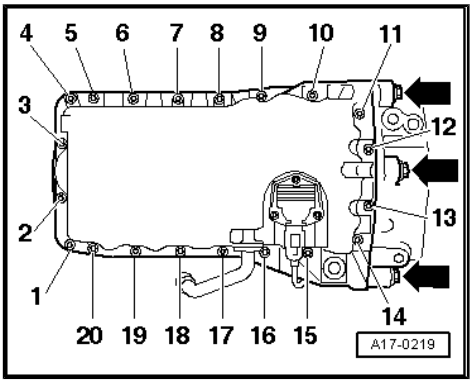
Note

- *Take particular care when applying sealant bead in area of rear sealing flange -arrows-.*
- *The sump must be installed within 5 minutes after applying the sealant.*

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– Fit sump and tighten bolts ⇒ page 163 .

• The sump must make flush contact with intermediate plate/ gearbox flange.



Note

♦ *When installing sump with engine removed from vehicle, ensure that sump is positioned flush with cylinder block at flywheel end.*

♦ *After fitting sump, sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.*

– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 211 .

– Install air pipe (left-side) ⇒ page 268 .

– Install air hose with plug-in connector ⇒ page 270 .

– Install noise insulation frame and noise insulation ⇒ Rep. gr. 50 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

1.4 Removing and installing oil pump

Special tools and workshop equipment required

♦ Circlip pliers (commercially available)

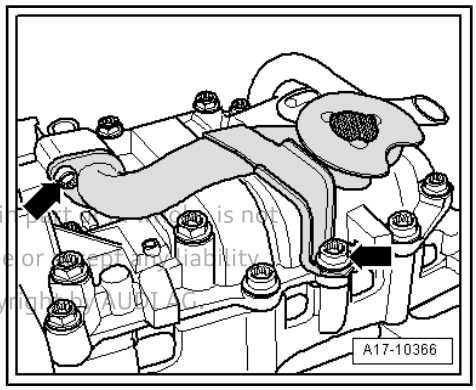
♦ M3 bolt

Removing

– Remove sump ⇒ page 165 .

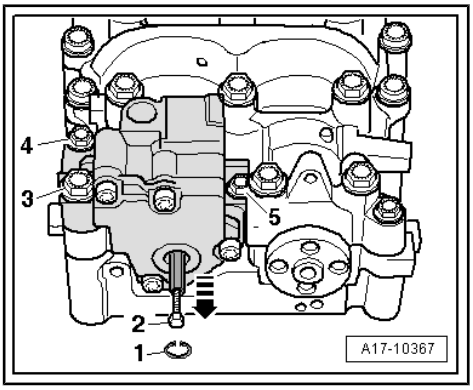
– Remove bolts -arrows- and detach suction pipe from oil pump.

– Remove circlip -1- using circlip pliers.



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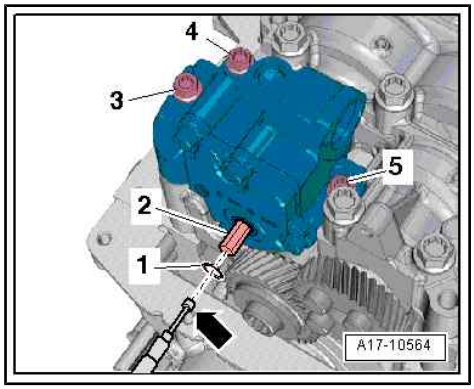
– If there is a thread in the drive shaft, screw an M3 bolt -2- into drive shaft and pull drive shaft out of oil pump -arrow-.



Note

If there is no thread in the drive shaft, use a magnet -arrow- and pull the drive shaft out of the oil pump.

– Remove bolts -3, 4, 5- and detach oil pump.



Caution

The bolt on the idler gear must NOT be loosened.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “1.1 Exploded view - oil pump, sump, balance shaft assembly”, page 160

Note

♦ *Fit new O-ring.*

♦ *Renew circlip if damaged or stretched.*

♦ *Circlip must fit securely in groove.*

– If no dowel sleeves for centring the oil pump are fitted in the balance shaft assembly, install missing dowel sleeves.

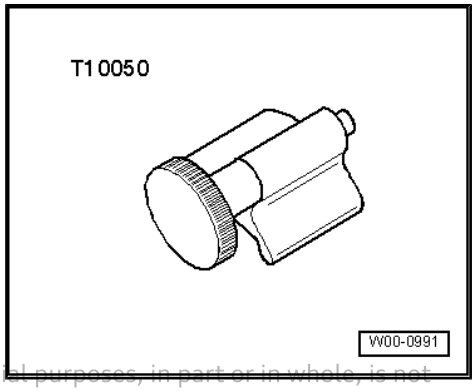
– Install sump ⇒ page 165 .

– Fill with engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

1.5 Removing balance shaft assembly

Special tools and workshop equipment required

♦ Crankshaft stop - T10050-



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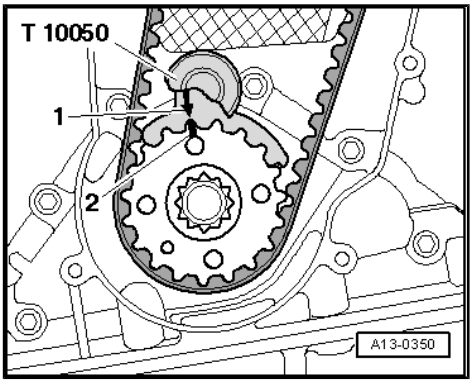
Procedure

– Remove vibration damper ⇒ page 65 .

Caution

Irreparable damage can be caused if the toothed belt slips.

- ***Only turn crankshaft in direction of engine rotation.***



– Rotate crankshaft by turning bolt for toothed belt sprocket until crankshaft is positioned at “TDC”.

– Lock crankshaft in position with crankshaft stop - T10050- .

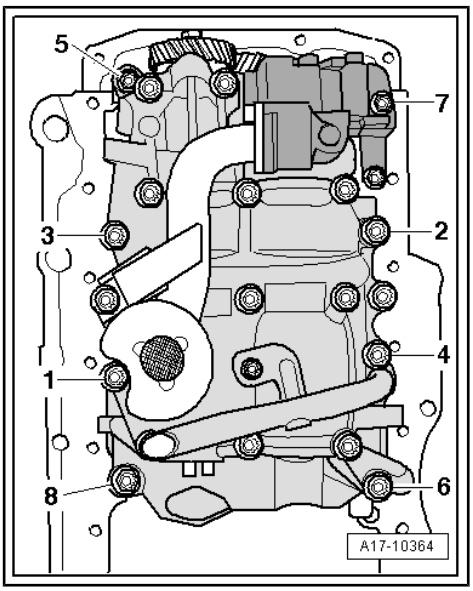
• The markings on the sprocket -2- and the crankshaft stop -1- must align -arrow-. The pin of the crankshaft stop must engage in the aperture in the sealing flange.

Note

The crankshaft stop can only be pushed onto the sprocket from the front face of the teeth.

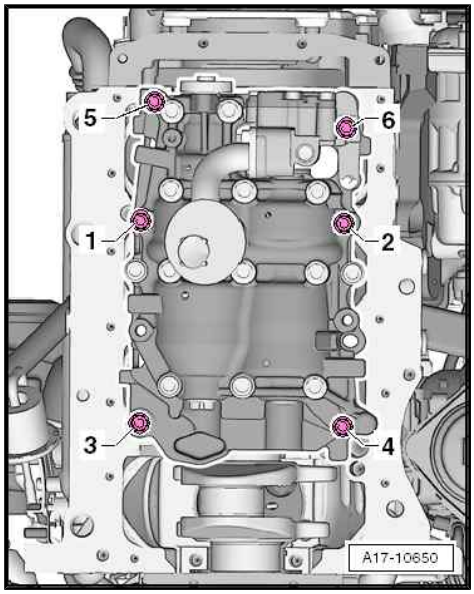
– Remove sump ⇒ page 165 .

– Balance shaft assembly with eight attachment points: Loosen bolts in the sequence -8 ... 1-.



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– Balance shaft assembly with six attachment points: Loosen bolts in the sequence -6 ... 1-.
– Remove bolts and detach balance shaft assembly with oil pump.



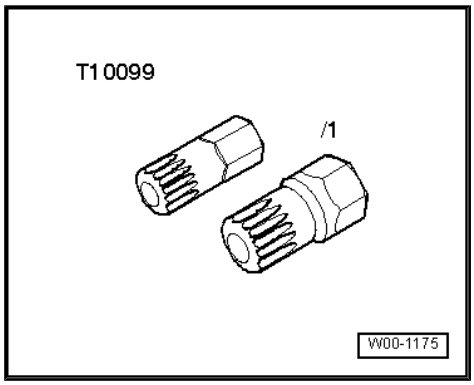
Note

- *Installing a new balance shaft assembly* ⇒ page 172 .
- *Re-installing the "old" balance shaft assembly* ⇒ page 175 .

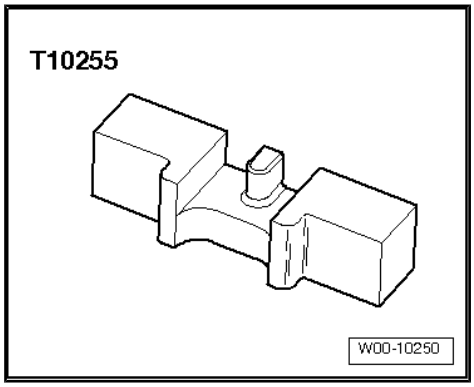
1.6 Installing a new balance shaft assembly

Special tools and workshop equipment required

- Bits - T10099-

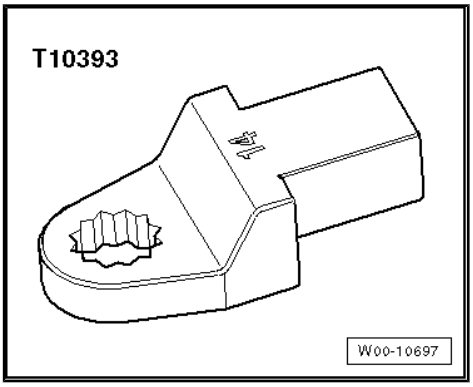


- Locking tool - T10255-



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- Insert tool, 14 mm - T10393-



Procedure

Tightening torque

- ⇒ “1.1 Exploded view - oil pump, sump, balance shaft assembly”, page 160
- Crankshaft locked in position with crankshaft stop - T10050- .

Note

- *The spur gear drive of the balance shaft assembly must be installed with a specified backlash.*
- *To achieve the correct backlash, a coating is already applied to the new idler gear.*
- *The coating is worn down rapidly and the backlash is then correct.*
- *Therefore, a new balance shaft assembly must always be installed in conjunction with a new idler gear which has the correct coating.*
- *Renew bolts tightened with specified tightening angle.*

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Caution

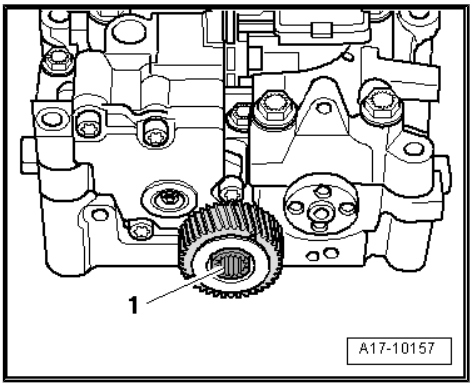
Thrust washer can slip out of position behind idler gear.

- ***Before positioning balance shaft assembly, slacken off bolt for idler gear as specified below, but not further. Installation position of thrust washer ⇒ page 163***

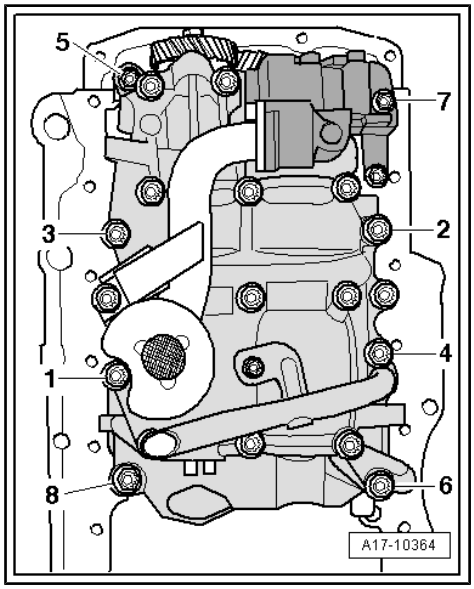
– Loosen bolt -1- for idler gear approx. 45° using e.g. bits - T10099- and insert tool, 14 mm - T10393- .

– If not already fitted, fit dowel sleeves ⇒ Item 17 (page 162) into cylinder block for centring balance shaft assembly.

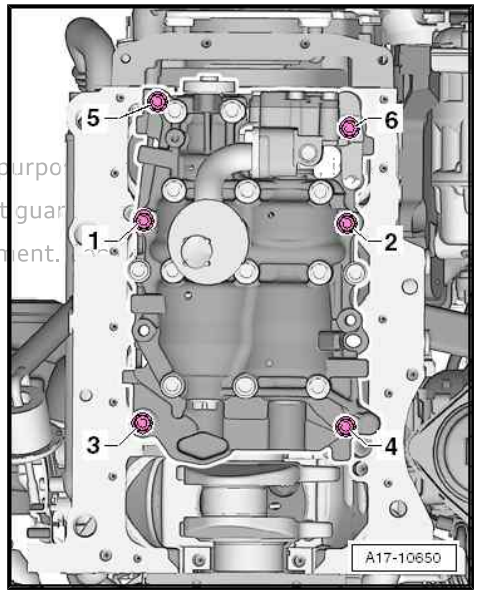
– Attach balance shaft assembly to cylinder block.



– Balance shaft assembly with eight attachment points: Tighten bolts for balance shaft assembly ⇒ page 163 .



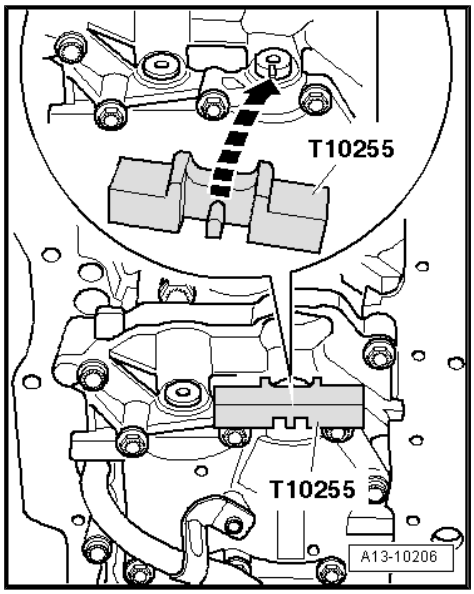
– Balance shaft assembly with six attachment points: Tighten bolts for balance shaft assembly ⇒ page 164 .



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– Lock balance shaft with locking tool - T10255- , turning balance shaft as required.

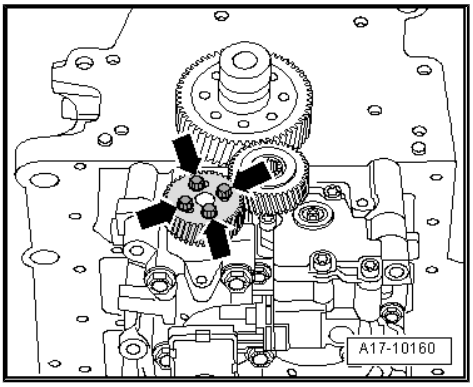
• The lug of the locking tool must engage in the groove of the balance shaft.



– Carefully fit balance shaft gear onto balance shaft; to do so, push idler gear slightly to one side.

• Take care not to damage the coating of the idler gear.

• The threaded holes in the balance shaft should be aligned as centrally as possible with the elongated holes in the balance shaft gear.



Note

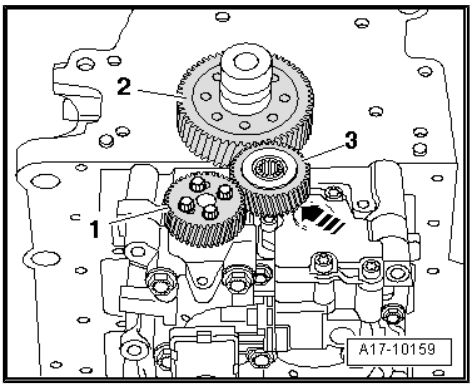
If it is not possible to align the elongated holes in the balance shaft gear with the threaded holes, you must turn the gear some teeth further as required and then fit it again.

– Tighten bolts -arrows- for balance shaft gear.

– Remove locking tool - T10255- .

Note

The following three steps have to be performed simultaneously (a second mechanic is therefore required):



– Push idler gear -3- firmly in direction of -arrow- into teeth on spur gear -2- and balance shaft gear -1-. If necessary use a wooden rod to do so.

– At the same time, turn balance shaft gear slightly anti-clockwise.

– Tighten bolt securing idler gear.

– Remove crankshaft stop - T10050- .

Note

After installation the idler gear must have no backlash. This can be checked by exerting light pressure by hand.

Remaining installation steps are carried out in reverse sequence; note the following:

– Install sump ⇒ page 165 .

– Top up engine oil and check oil level ⇒ Maintenance ; Booklet 808 .

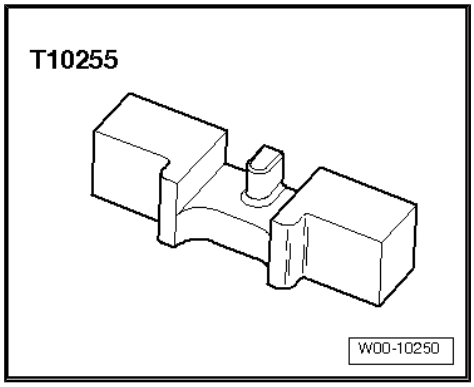
– Install vibration damper ⇒ page 65 .

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1.7 Re-installing a used balance shaft assembly

Special tools and workshop equipment required

- Locking tool - T10255-



Procedure

Note

- *If re-installing the "old" balance shaft assembly and neither the spur gear on the crankshaft nor the crankshaft itself have been renewed, proceed as described in the following. It is also essential that the idler gear has NOT been slackened.*
- *If the bolt for the idler gear has been slackened or the spur gear on the crankshaft or the crankshaft itself have been renewed, you must install a new idler gear with the appropriate coating. Procedure for installation*
  ⇒ "1.6 Installing a new balance shaft assembly", page 172 .
- *Renew bolts tightened with specified tightening angle.*

– Lock balance shaft with locking tool - T10255- , turning balance shaft as required.

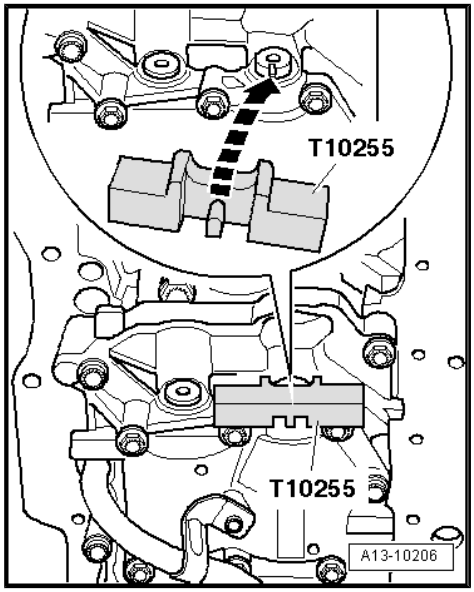
• The lug of the locking tool must engage in the groove of the balance shaft.

– If not already fitted, fit dowel sleeves ⇒ Item 17 (page 162) into cylinder block for centring balance shaft assembly.

– Attach balance shaft assembly to cylinder block.

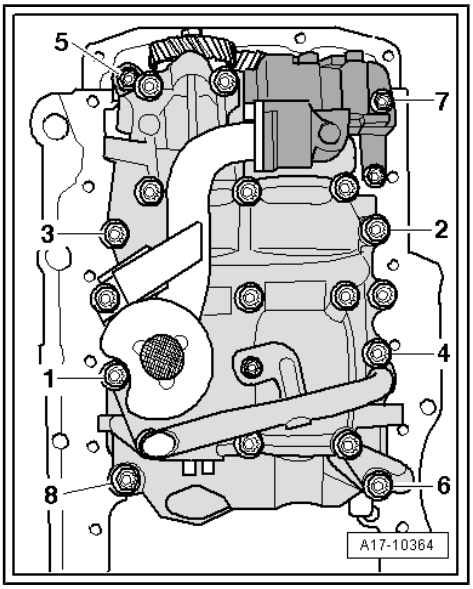
• With the balance shaft locked in position, the idler gear must engage in the spur gear on the crankshaft.

• Idler gear must have noticeable backlash.



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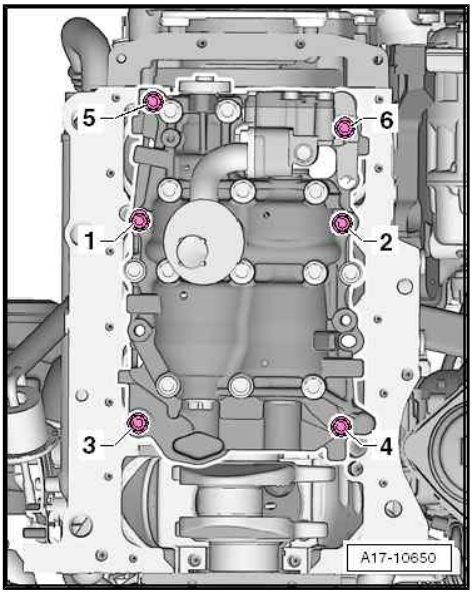
– Balance shaft assembly with eight attachment points: Tighten bolts for balance shaft assembly ⇒ page 163 .



– Balance shaft assembly with six attachment points: Tighten bolts for balance shaft assembly ⇒ page 164 .
– Remove crankshaft stop - T10050- .

Remaining installation steps are carried out in reverse sequence; note the following:

– Install sump ⇒ page 165 .
– Top up engine oil and check oil level ⇒ Maintenance ; Booklet 808 .
– Install vibration damper ⇒ page 65 .



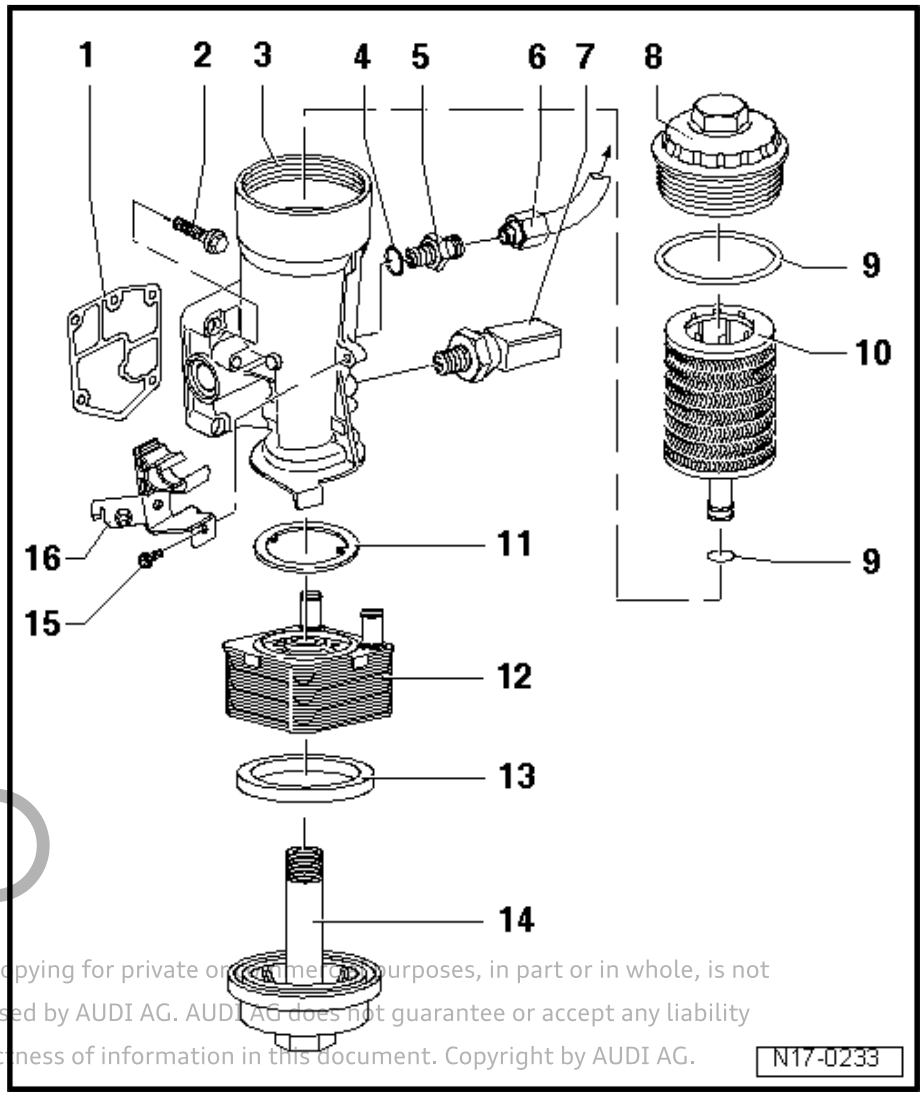
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2 Oil filter bracket and engine oil cooler

Overview

- ⇒ “2.1 Exploded view - oil filter bracket and engine oil cooler”, page 178
- ⇒ “2.2 Removing and installing oil filter bracket with engine oil cooler”, page 180
- ⇒ “2.3 Removing and installing oil pressure switch F1 ”, page 184
- ⇒ “2.4 Checking oil pressure switch F1 ”, page 185
- ⇒ “2.5 Checking oil pressure”, page 187
- ⇒ “2.6 Engine oil”, page 188
- ⇒ “2.7 Checking oil level”, page 188

2.1 Exploded view - oil filter bracket and engine oil cooler



1 - Gasket
- ❑ Renew

2 - Bolt
- ❑ Renew
- ❑ Tightening torque and sequence ⇒ page 179

3 - Oil filter bracket
- ❑ With oil retention valve
- ❑ Removing and installing ⇒ “2.2 Removing and installing oil filter bracket with engine oil cooler”, page 180

4 - Seal
- ❑ Renew

5 - Connection
- ❑ 33 Nm

6 - Oil supply line
- ❑ To turbocharger
- ❑ Installation sequence:
  - – Screw in union nuts by hand until they make contact.
  - – Tighten union nuts to 22 Nm.
  - – Secure bracket.

7 - Oil pressure switch - F1-
- ❑ With seal
- ❑ Renew seal.
- ❑ Opening/closing pressure 0.7 bar
- ❑ Brown insulation
- ❑ Removing and installing ⇒ page 184
- ❑ Checking ⇒ page 185

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- ❑ 20 Nm

8 - Sealing cap

- ❑ 25 Nm

9 - O-ring

- ❑ Renew

10 - Oil filter element

- ❑ Removing and installing ⇒ Maintenance ; Booklet 808

11 - Seal

- ❑ Renew
- ❑ Installation position ⇒ page 180

12 - Engine oil cooler

- ❑ See note ⇒ page 160
- ❑ Connection diagram - coolant hoses ⇒ page 189
- ❑ Removing and installing
  ⇒ “2.2 Removing and installing oil filter bracket with engine oil cooler”, page 180

13 - Seal

- ❑ Renew

14 - Plug

- ❑ 25 Nm

15 - Bolt

- ❑ 9 Nm

16 - Bracket

- ❑ For wiring harness

Oil filter bracket - tightening torque and sequence

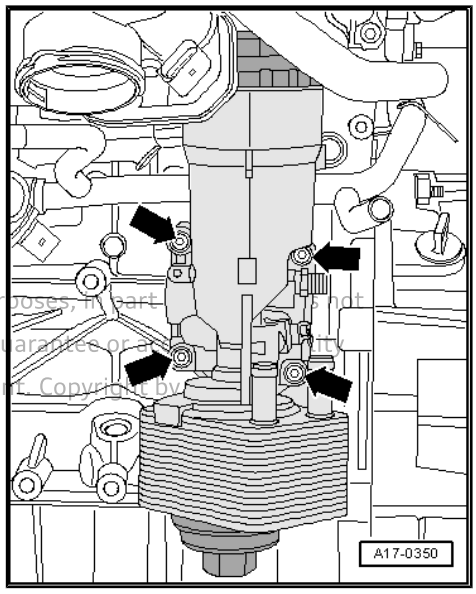
Note

Renew bolts tightened with specified tightening angle.

– Fit bolts at top left and bottom right first.

– Tighten bolts in 2 stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-Arrows-	14 Nm in diagonal sequence
2.	-Arrows-	Turn 90° further in diagonal sequence

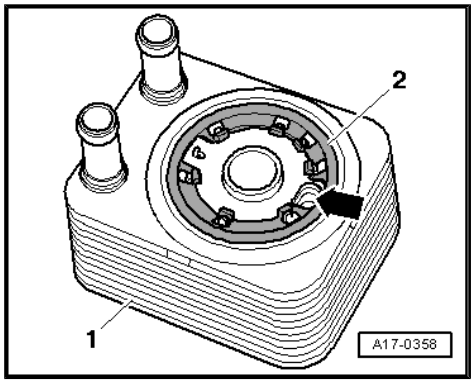


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Installation position of seal for engine oil cooler

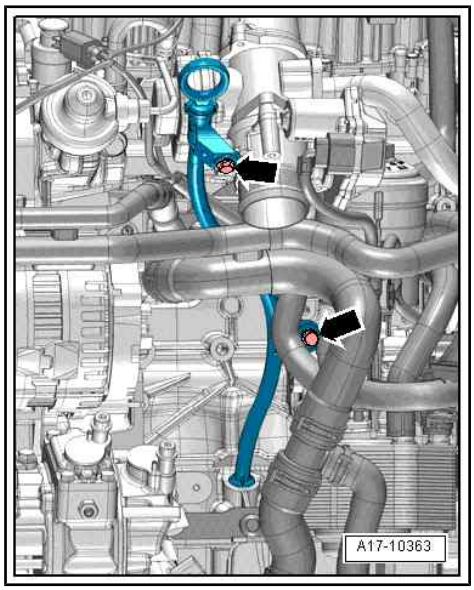
– Fit seal -2- so it can be attached to all tabs on engine oil cooler -1-.

• The oil drilling -arrow- must not be covered by the seal.



Guide tube for oil dipstick - tightening torque

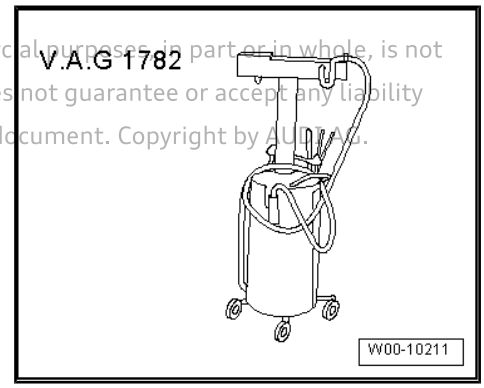
– Tighten bolts -arrows- to 9 Nm.



2.2 Removing and installing oil filter bracket with engine oil cooler

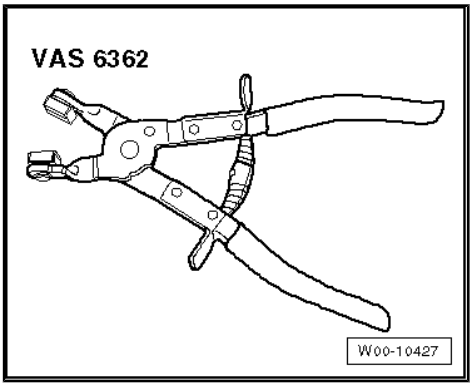
Special tools and workshop equipment required

♦ Used oil collection and extraction unit - V.A.G 1782-

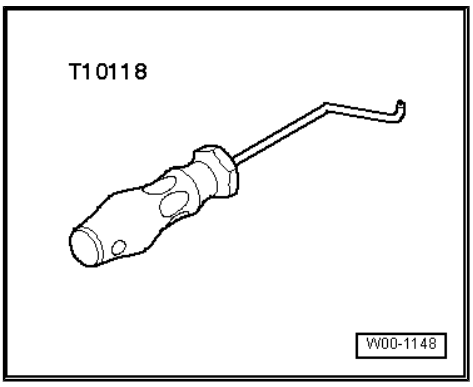


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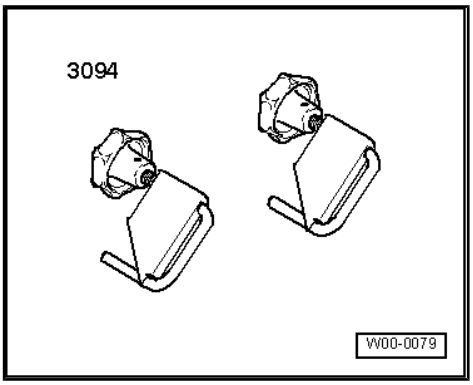
♦ Hose clip pliers - VAS 6362-



♦ Assembly tool - T10118-



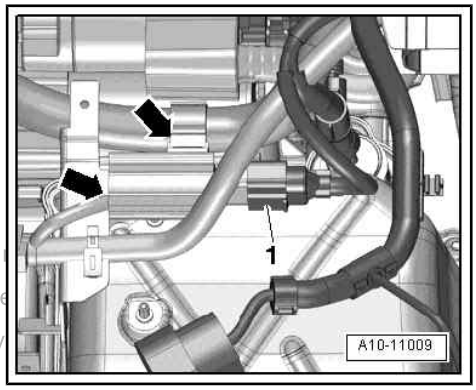
♦ Hose clamps up to 25 mm - 3094-



Removing

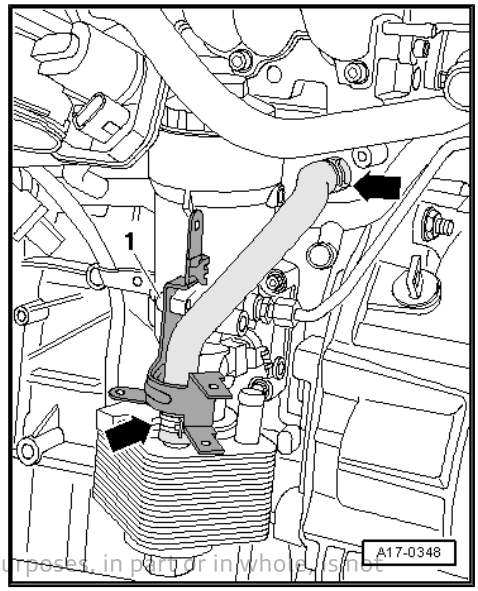
– Remove radiator cowl ⇒ page 234 .

– Move wiring harnesses -arrows- and electrical connector -1- clear at bracket and at air pipe.



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– Unscrew bolt -1- and detach bracket for wiring harness.

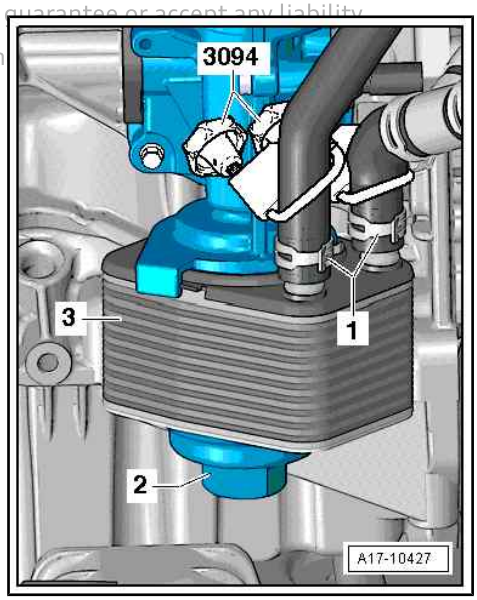


Note

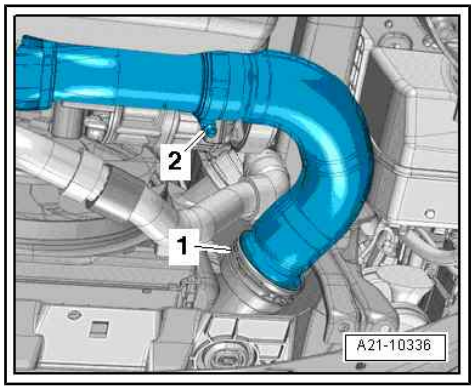
Disregard -arrows-.

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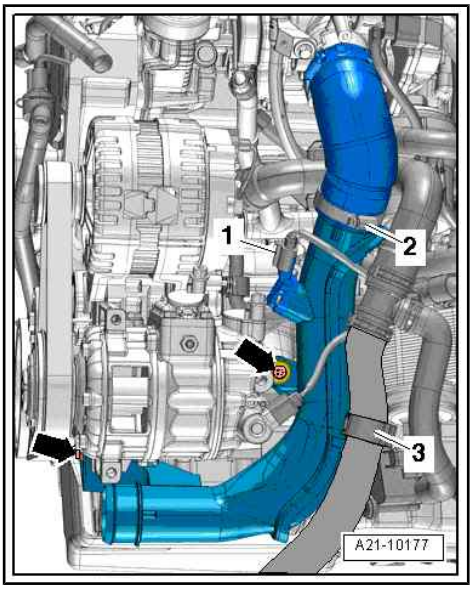
– Clamp off coolant hoses with hose clamps up to 25 mm - 3094- as shown in illustration.
– Disconnect coolant hoses -1-.



– Release hose clip -2-, lift retaining clip -1- and remove air hose.



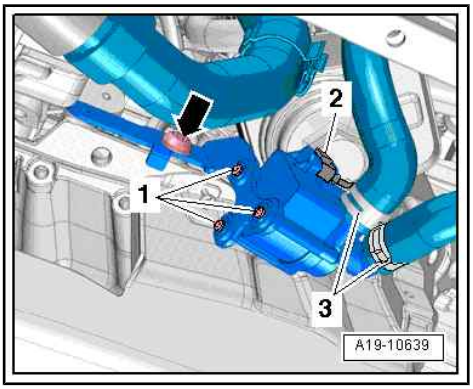
– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe (front).



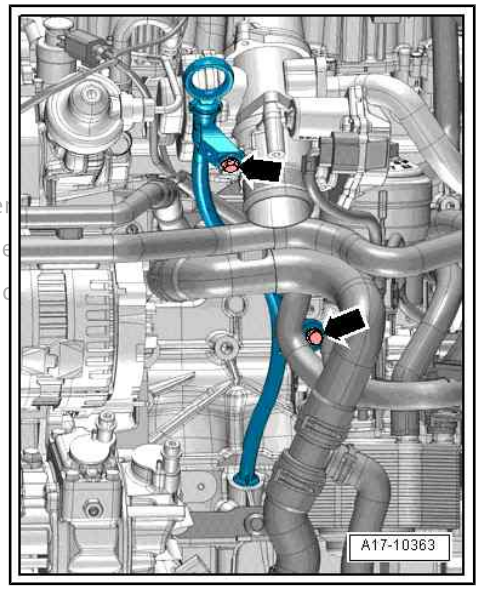
– Remove bolt -arrow-.
– Press pump for exhaust gas recirculation cooler - V400- to side.

Note

Disregard -items 1, 2, 3-.



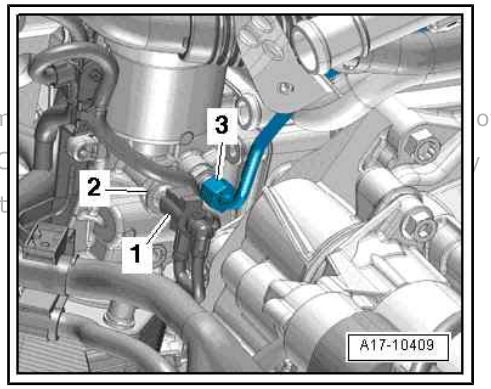
– Pull oil dipstick out slightly and remove bolts -arrows-.
– Pull guide tube for oil dipstick upwards out of cylinder block and push to one side.



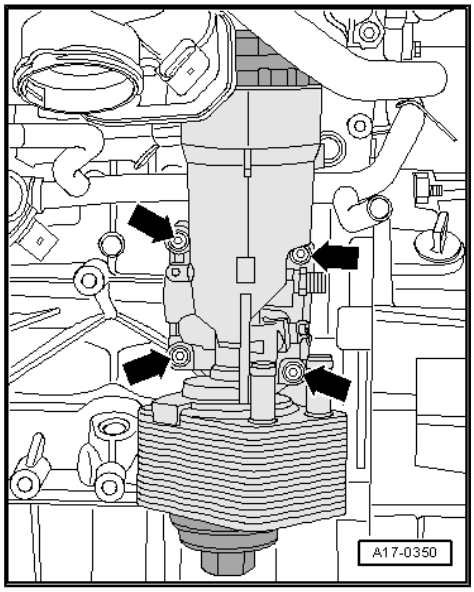
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– Unplug electrical connector -1- at oil pressure switch - F1- using assembly tool - T10118- .
– Unscrew oil pressure switch -2-.
– Disconnect oil supply line from connection on oil filter bracket. To do so, counterhold at hexagon flats with an open-end spanner and loosen union nut -3-.



– Position used oil collection and extraction unit - V.A.G 1782- below engine.
– Unscrew bolts -arrows- and remove oil filter bracket.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “2.1 Exploded view - oil filter bracket and engine oil cooler”, page 178

Note

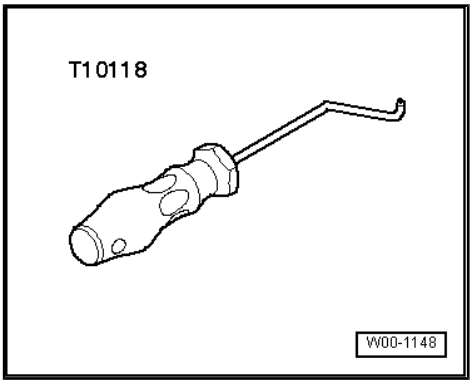
♦ *Renew gaskets, seals and O-rings.*
♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
♦ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

– Install dipstick guide tube ⇒ page 180 .
– Install pump for exhaust gas recirculation cooler - V400- ⇒ page 211 .
– Install air pipe (front) ⇒ page 268 .
– Install air hose with plug-in connector ⇒ page 270 .
– Install radiator cowl ⇒ page 234 .
– Top up engine oil and check oil level ⇒ Maintenance ; Booklet 808 .
– Fill up cooling system (or change coolant if the engine oil cooler has been renewed) ⇒ page 200 .

2.3 Removing and installing oil pressure switch - F1-

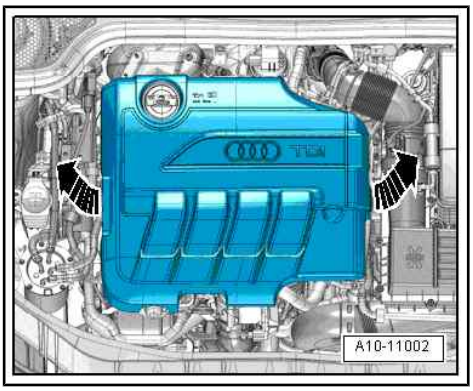
Special tools and workshop equipment required

♦ Assembly tool - T10118-



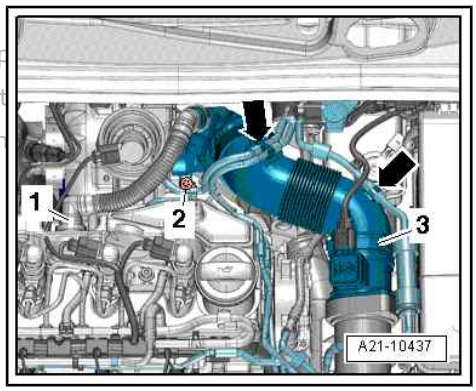
Removing

– Remove engine cover panel -arrows-.



– Remove air cleaner housing ⇒ Rep. gr. 23 .

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– Unplug electrical connector -1- at oil pressure switch - F1- using assembly tool - T10118- .

– Remove oil pressure switch - F1- -2-.

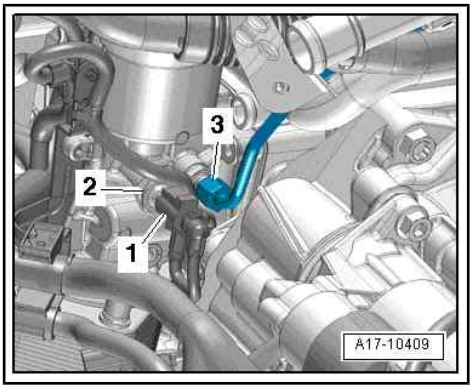
Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “2.1 Exploded view - oil filter bracket and engine oil cooler”, page 178

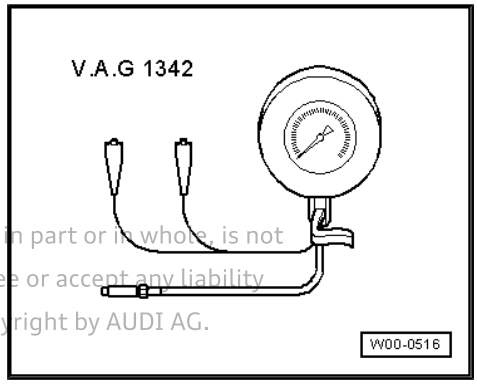
– Install air cleaner housing ⇒ Rep. gr. 23 .



2.4 Checking oil pressure switch - F1-

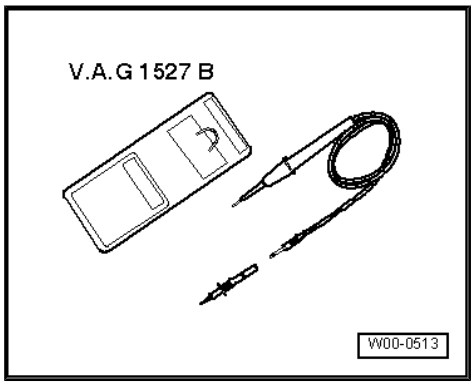
Special tools and workshop equipment required

- Oil pressure tester - V.A.G 1342-



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- Voltage tester - V.A.G 1527B-



- Auxiliary measuring set - V.A.G 1594C-

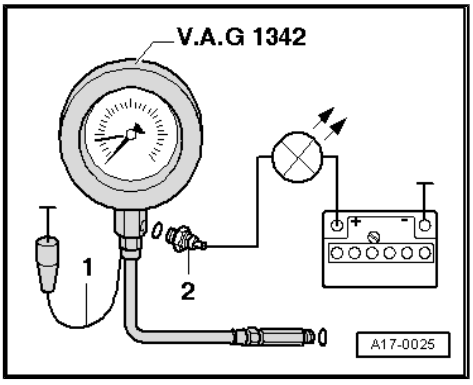


Procedure

- Oil level OK

– Remove oil pressure switch - F1- ⇒ page 184 .

– Connect oil pressure tester - V.A.G 1342- to bore for oil pressure switch.
– Screw oil pressure switch - F1- -item 2- into threaded hole in oil pressure tester.
– Connect brown wire -1- of oil pressure tester to earth (–).
– Connect voltage tester - V.A.G 1527B- with adapter lead from auxiliary measuring set - V.A.G 1594C- to oil pressure switch - F1- and battery positive (+).
• LED should not light up.



Note

Renew oil pressure switch - F1- if LED lights up at this stage.

– Start engine.

Note

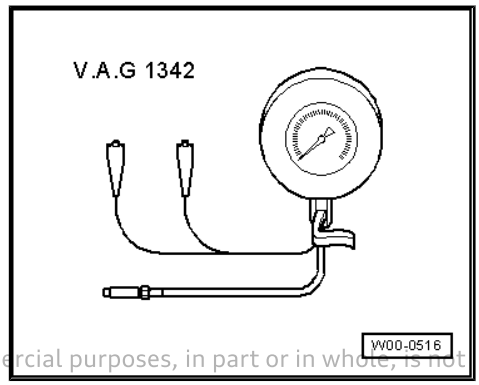
Observe oil pressure tester and LED while starting engine, as switching point of oil pressure switch may already be exceeded when starting.

• LED should light up at 0.55 ... 0.85 bar.
– Renew oil pressure switch - F1- if LED does not light up ⇒ page 184 .

2.5 Checking oil pressure

Special tools and workshop equipment required

♦ Oil pressure tester - V.A.G 1342-



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Procedure

• Oil level OK
– Remove oil pressure switch - F1- ⇒ page 184 .
– Connect oil pressure tester - V.A.G 1342- to threaded hole for oil pressure switch - F1- .
– Screw a used oil pressure switch into threaded hole on oil pressure tester - V.A.G 1342- to seal hole.
– Start engine.
• Oil pressure when starting and then at idling speed: at least 0.8 bar

If specification is not obtained, switch off engine immediately and check oil pump drive; renew oil pump if necessary
⇒ “1.4 Removing and installing oil pump”, page 169 .

If specification is obtained, let engine warm up.

- Oil pressure specification at operating temperature and 2000 rpm: at least 2.0 bar

2.6 Engine oil

Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .

2.7 Checking oil level

Check oil level ⇒ Maintenance ; Booklet 808 .

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19 – Cooling

1 Cooling system

Overview

- ⇒ “1.1 Connection diagrams - coolant hoses, vehicles with engine codes CBAA, CBAB, CBBB”, page 189
- ⇒ “1.2 Connection diagram - coolant hoses, vehicles with engine code CBEA”, page 192
- ⇒ “1.3 Removing and installing engine preheating element Z97 - vehicles with engine code CBEA”, page 195
- ⇒ “1.4 Draining and filling cooling system”, page 196
- ⇒ “1.5 Checking cooling system for leaks”, page 204

WARNING

Risk of scalding due to hot steam and hot coolant.

- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

Note

- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The arrow markings on coolant pipes and on ends of hoses must align.*

1.1 Connection diagrams - coolant hoses, vehicles with engine codes CBAA, CBAB, CBBB

Connection diagram - coolant hoses without 4/2-way valve

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1 - Radiator

- ❑ If renewed, refill system with fresh coolant

2 - Pump for exhaust gas recirculation cooler - V400-

3 - Engine oil cooler

4 - Thermostat

5 - Coolant pump

6 - Cylinder head and cylinder block

- ❑ If renewed, refill system with fresh coolant

7 - Coolant expansion tank

- ❑ With filler cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 205

8 - Exhaust gas recirculation cooler

9 - Auxiliary heater

10 - Circulation pump - V55-

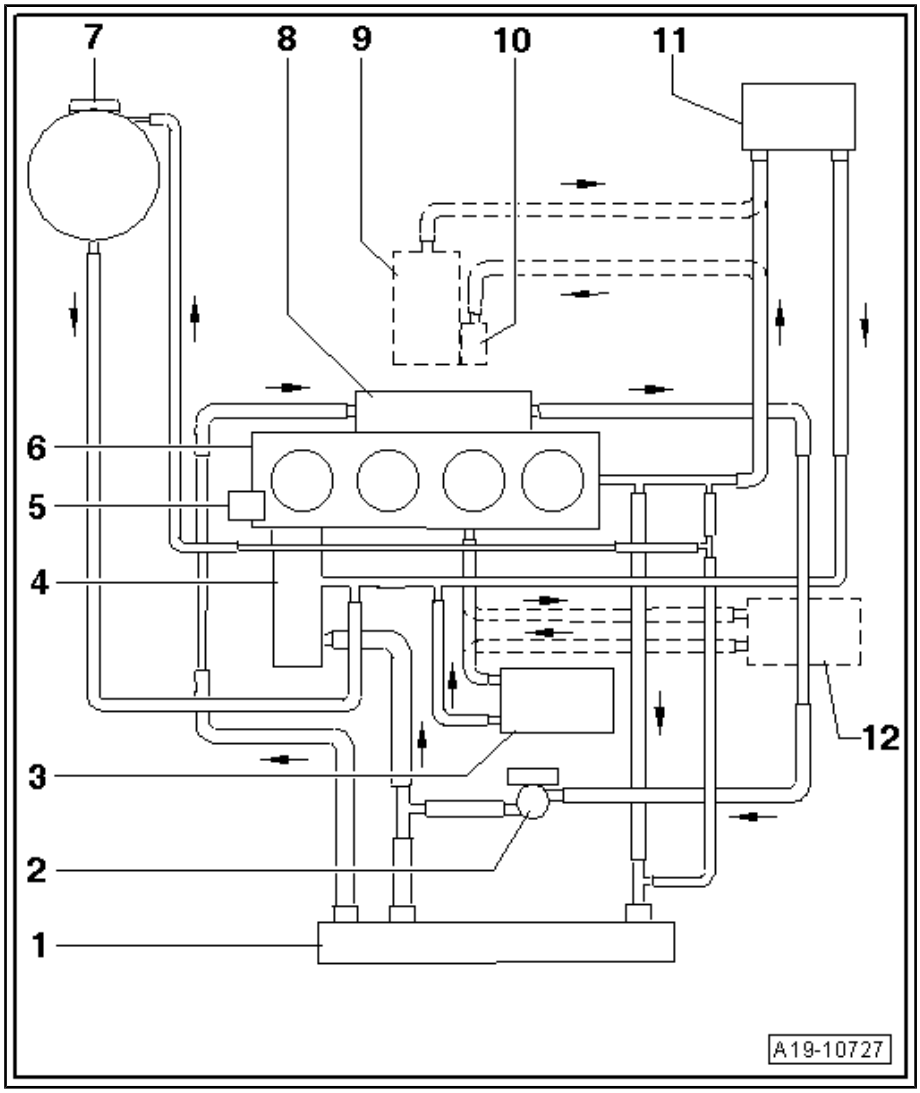
- ❑ Only on vehicles with auxiliary heater

11 - Heat exchanger for heater

- ❑ If renewed, refill system with fresh coolant

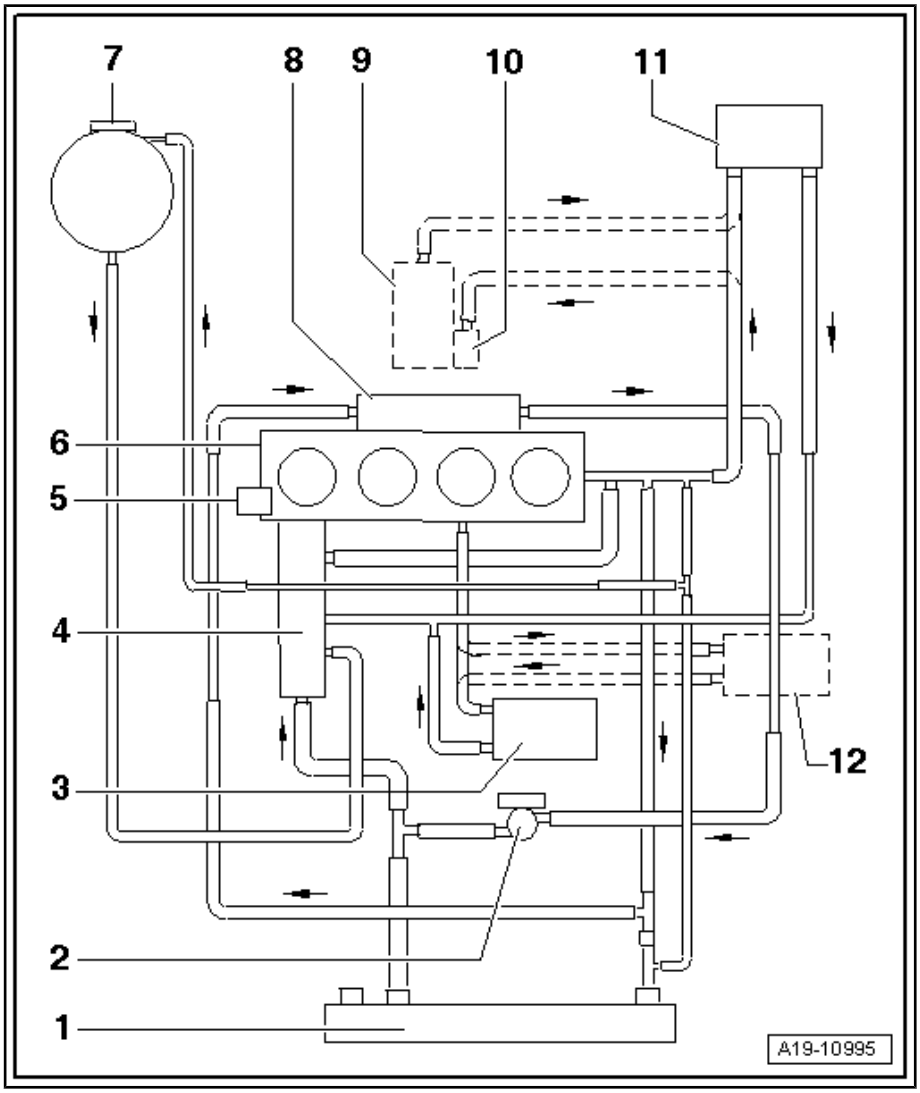
12 - Gear oil cooler

- ❑ For dual clutch gearbox
- ❑ If renewed, refill system with fresh coolant



Connection diagram - coolant hoses with 4/2-way valve

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1 - Radiator

- ❑ If renewed, refill system with fresh coolant

2 - Pump for exhaust gas recirculation cooler - V400-

3 - Engine oil cooler

4 - 4/2-way valve

- ❑ Removing and installing ⇒ page 209

5 - Coolant pump

6 - Cylinder head and cylinder block

- ❑ If renewed, refill system with fresh coolant

7 - Coolant expansion tank

- ❑ With filler cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 205

8 - Exhaust gas recirculation cooler

9 - Auxiliary heater

10 - Circulation pump - V55-

- ❑ Only on vehicles with auxiliary heater

11 - Heat exchanger for heater

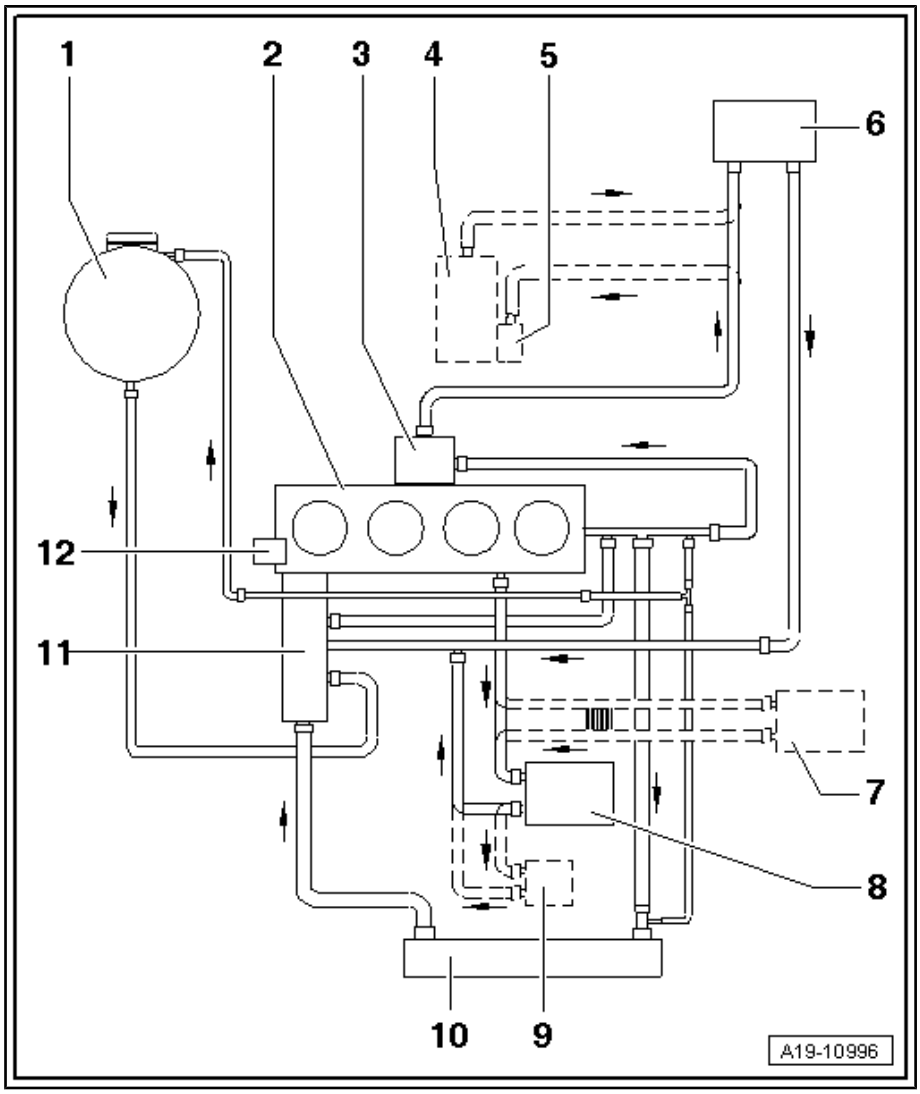
- ❑ If renewed, refill system with fresh coolant

12 - Gear oil cooler

- ❑ For dual clutch gearbox
- ❑ If renewed, refill system with fresh coolant

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1.2 Connection diagram - coolant hoses, vehicles with engine code CBEA



1 - Coolant expansion tank

- ❑ With filler cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 205

2 - Cylinder head and cylinder block

- ❑ If renewed, refill system with fresh coolant

3 - Exhaust gas recirculation cooler

- ❑ If renewed, refill system with fresh coolant
- ❑ Removing and installing ⇒ page 346

4 - Auxiliary heater

5 - Circulation pump - V55-

6 - Heat exchanger for heater

- ❑ If renewed, refill system with fresh coolant

7 - Gear oil cooler

- ❑ For dual clutch gearbox
- ❑ If renewed, refill system with fresh coolant

8 - Engine oil cooler

9 - Engine preheating element - Z97-

- ❑ Removing and installing ⇒ page 195

10 - Radiator

- ❑ If renewed, refill system with fresh coolant

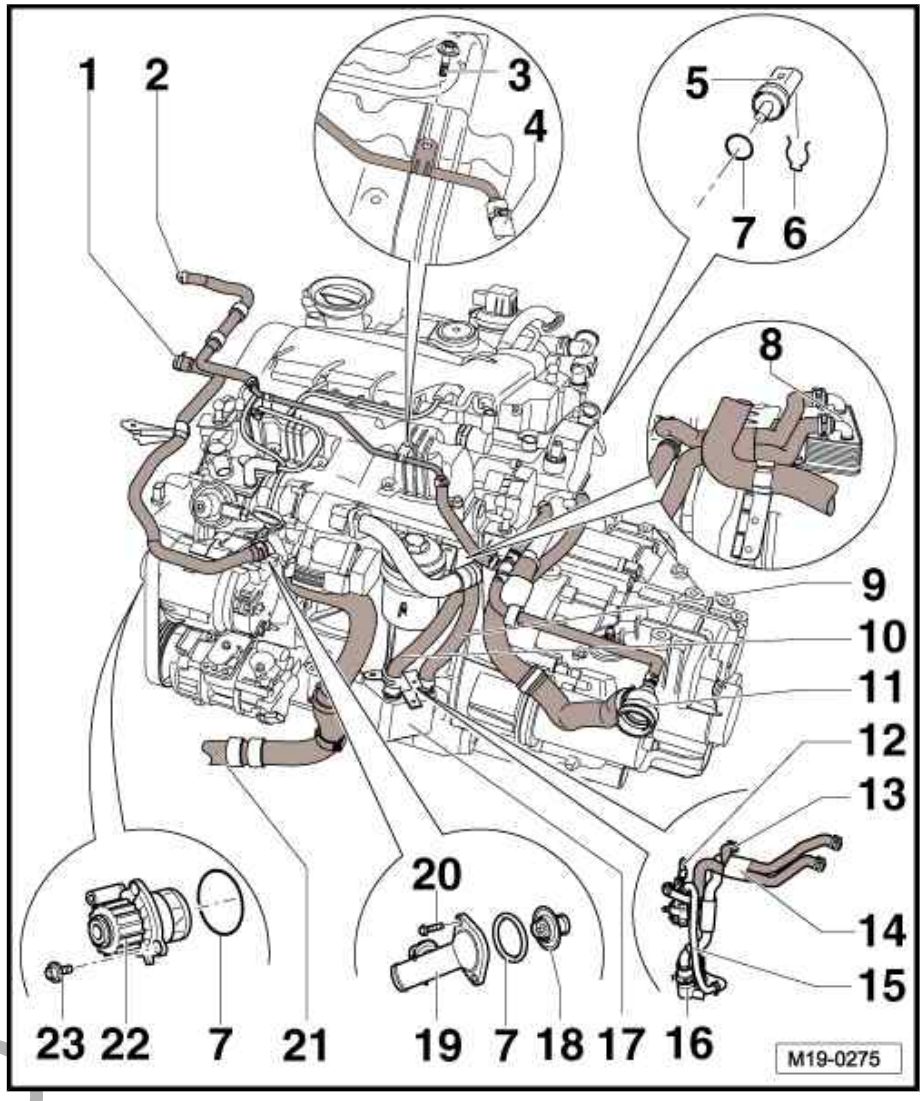
11 - 4/2-way valve

- ❑ Removing and installing ⇒ page 209

12 - Coolant pump

Parts of cooling system - intake side

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1 - Coolant hose to coolant expansion tank (bottom)

2 - Coolant hose to coolant expansion tank (top)

3 - Bolt

- ❑ 10 Nm

4 - Breather pipe

5 - Coolant temperature sender - G62-

6 - Retaining clip

7 - O-ring

- ❑ Renew

8 - Gear oil cooler

- ❑ Only on vehicles with dual clutch gearbox

9 - Coolant hose (supply) on engine oil cooler

- ❑ On vehicles without gear oil cooler
- ❑ On vehicles with gear oil cooler: coolant hose (return) on gear oil cooler

10 - Coolant hose (return) on engine oil cooler

11 - To top of radiator

12 - Bracket for wiring harness and coolant pipe

13 - Coolant hose

- ❑ To coolant pipe at cylinder block

14 - Coolant hoses

- ❑ For gear oil cooler
- ❑ Only on vehicles with dual clutch gearbox
- ❑ Installed according to vehicle equipment

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15 - Coolant pipe

- ❑ For engine pre-heating element - Z97-
- ❑ Exploded view ⇒ page 194
- ❑ Installed according to vehicle equipment

16 - Engine preheating element - Z97-

- ❑ Exploded view ⇒ page 194
- ❑ Removing and installing ⇒ page 195
- ❑ Installed according to vehicle equipment

17 - Engine oil cooler

18 - Thermostat

- ❑ Checking thermostat ⇒ page 209

19 - Connection

20 - Bolt

- ❑ 15 Nm

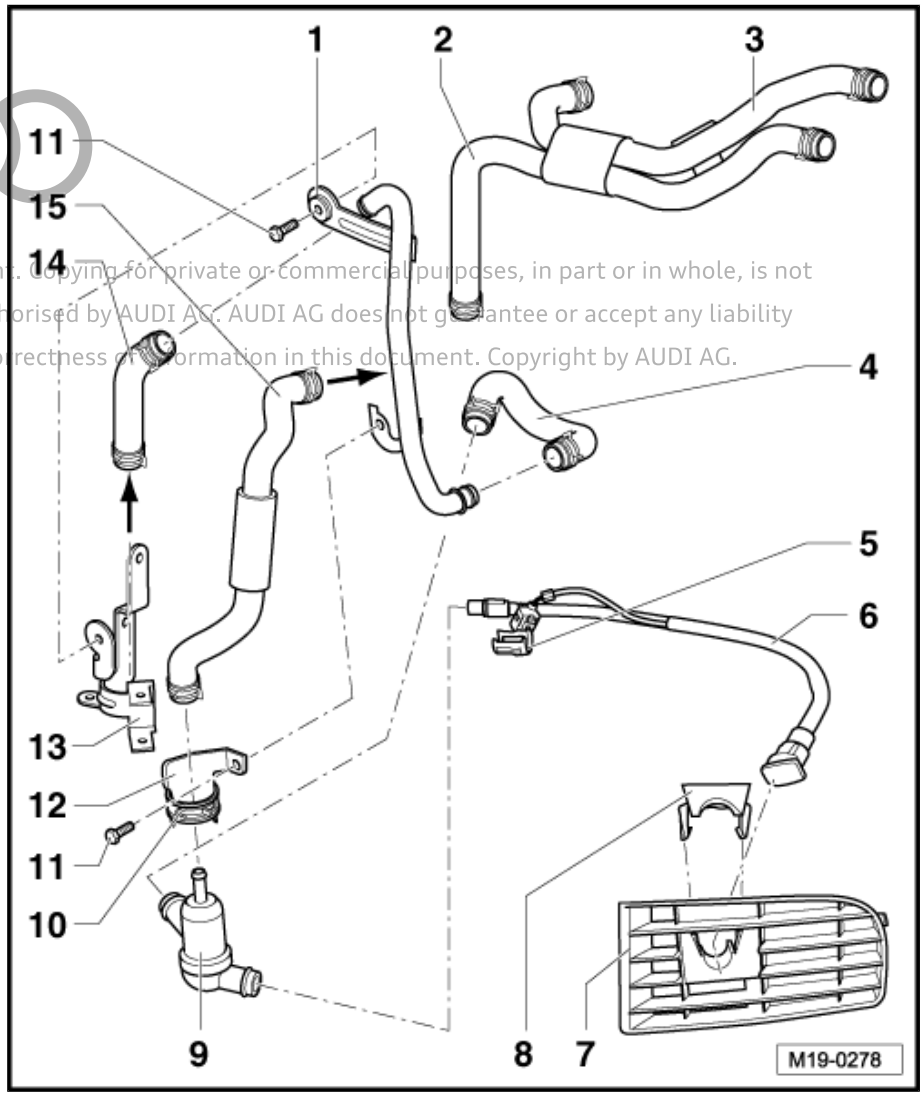
21 - Hose to bottom of radiator

22 - Coolant pump

23 - Bolt

- ❑ 40 Nm

Exploded view - engine preheating element - Z97-



1 - Coolant pipe for engine preheating element - Z97-

2 - Coolant hose between connection on cylinder block and gear oil cooler

3 - Coolant hose between gear oil cooler and engine oil cooler

4 - Coolant hose between coolant pipe for engine preheating and engine preheating element - Z97-

5 - Locking device

6 - Cable for connection to external current source

7 - Air intake grille (left-side)

- – Removing and installing air intake grille ⇒ Rep. gr. 63

8 - Retainer

9 - Engine preheating element - Z97-

- ❑ Removing and installing ⇒ page 195

10 - Clamp for engine preheating element - Z97-

- ❑ Secured to bracket

11 - Bolt

- ❑ 10 Nm

12 - Bracket for engine preheating element - Z97-

13 - Bracket for wiring harness and coolant pipe

14 - Coolant hose between engine oil cooler and coolant pipe for engine preheating element - Z97-

15 - Coolant hose between engine preheating element - Z97- and coolant pipe on cylinder block

Parts of cooling system - gearbox side

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1 - Coolant hose (supply) on radiator

2 - Coolant hose to breather pipe

3 - Coolant return hose for exhaust gas recirculation cooler

4 - Coolant hose (return) on radiator

5 - Coolant supply hose for heat exchanger for heater

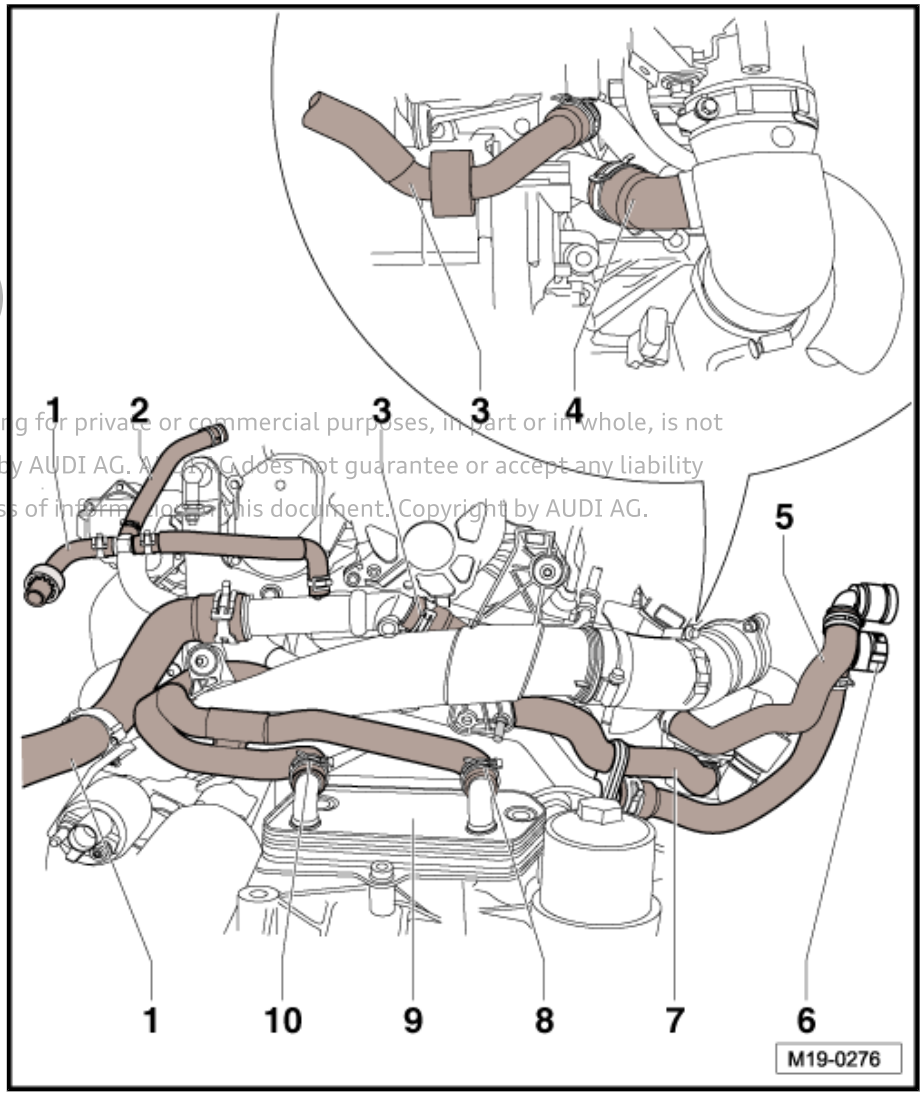
6 - Coolant return hose for heat exchanger for heater

7 - Coolant supply hose for exhaust gas recirculation cooler

8 - Coolant supply hose for gear oil cooler

9 - Gear oil cooler

10 - Coolant hose (return) on gear oil cooler

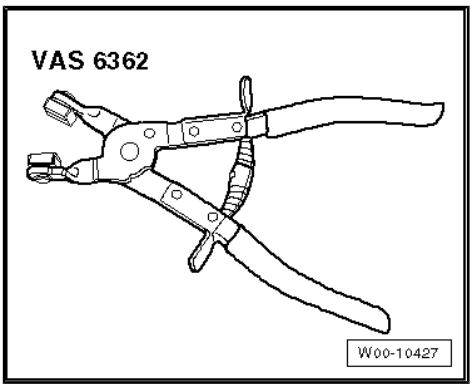


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1.3 Removing and installing engine preheating element - Z97- - vehicles with engine code CBEA

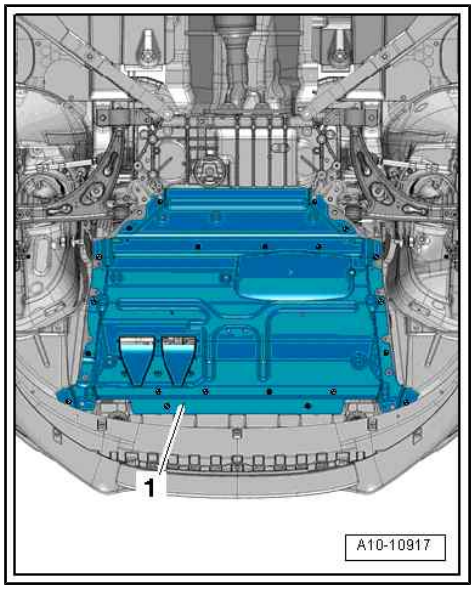
Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-

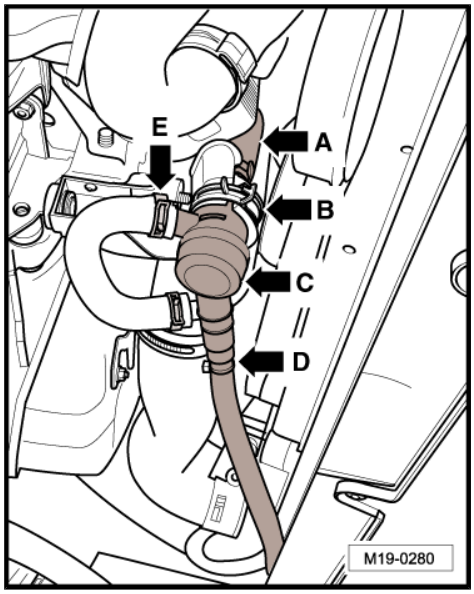


Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .
– Drain coolant ⇒ page 196 .



– Loosen hose clip and detach coolant hose from connection -arrow A-.
– Unfasten retainer on electrical connector and detach connector for engine preheating element -arrow D-.
– Loosen hose clip and detach coolant hose from connection -arrow E-.
– Release clamp -arrow B- and pull out engine preheating element -arrow C- from below.



Installing:

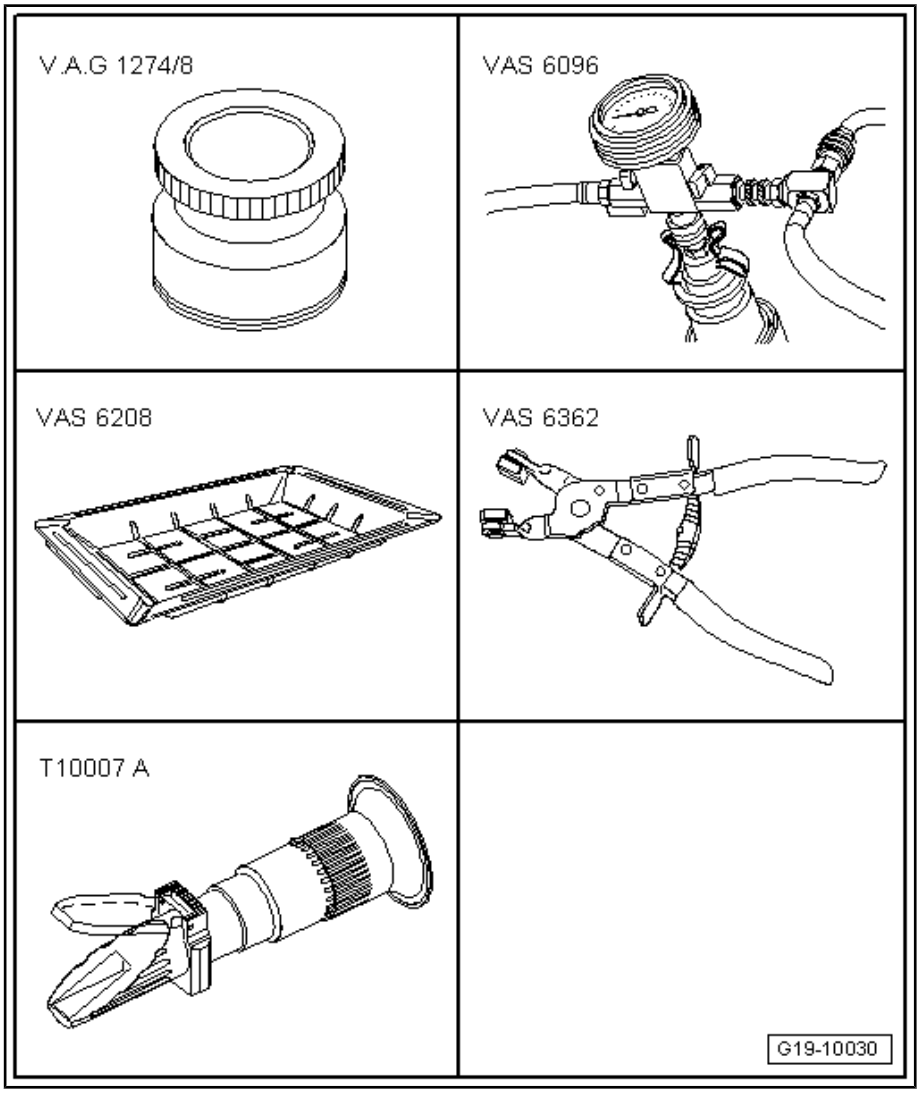
Installation is carried out in reverse order; note the following:

– Fill up with coolant ⇒ page 196 .
– Install noise insulation ⇒ Rep. gr. 50 .

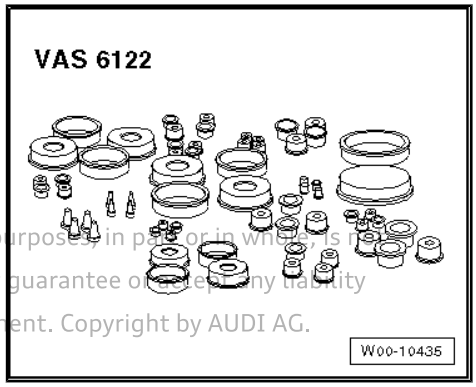
1.4 Draining and filling cooling system

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Special tools and workshop equipment required



- Adapter for cooling system tester - V.A.G 1274/8-
- Cooling system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Hose clip pliers - VAS 6362-
- Refractometer - T10007 A- or refractometer - T10007B-
- Engine bung set - VAS 6122-

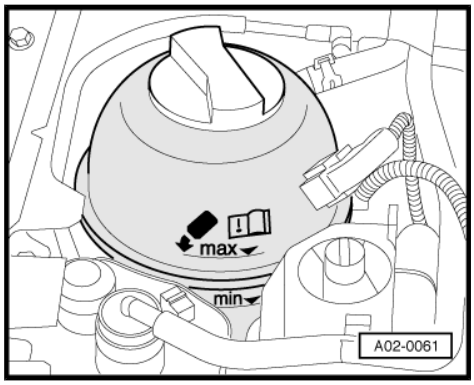


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- Safety goggles

♦ Protective gloves

Draining



Note

Collect drained coolant in a clean container for re-use or disposal.

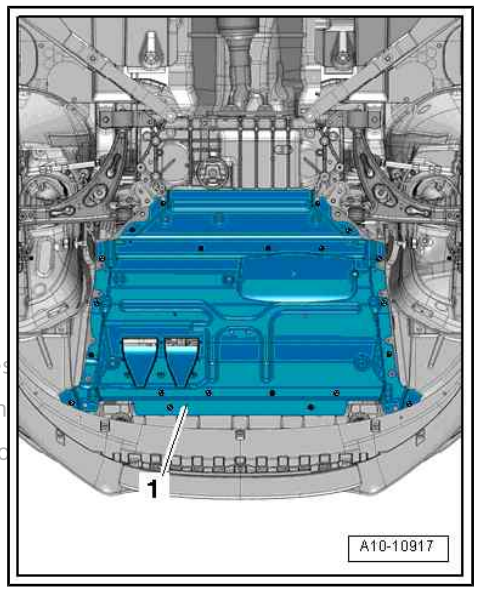
WARNING

Risk of scalding due to hot steam and hot coolant.

- ***The cooling system is under pressure when the engine is hot.***
- ***To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.***

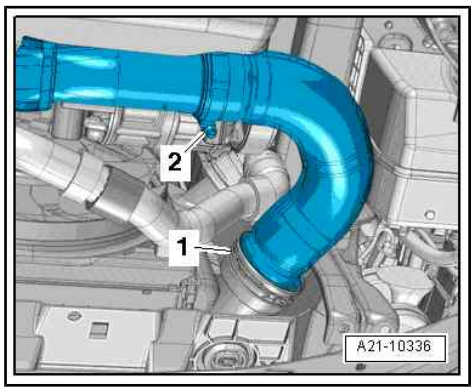
– Open filler cap on coolant expansion tank.

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



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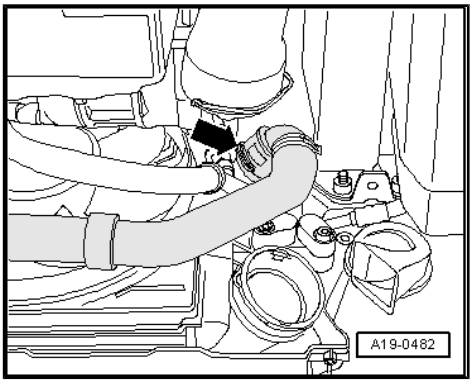
– Release hose clip -2-, lift retaining clip -1- and remove air hose.



Note

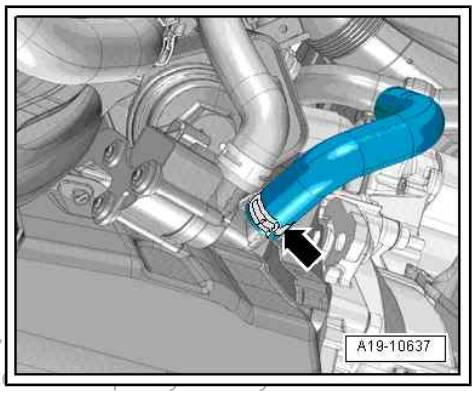
To prevent coolant from entering, seal off connection on charge air cooler with a clean plug from engine bung set - VAS 6122- .

– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Lift retaining clip -arrow-, disconnect coolant hose (bottom) from radiator and drain off coolant.



Vehicles with pump for exhaust gas recirculation cooler - V400- :

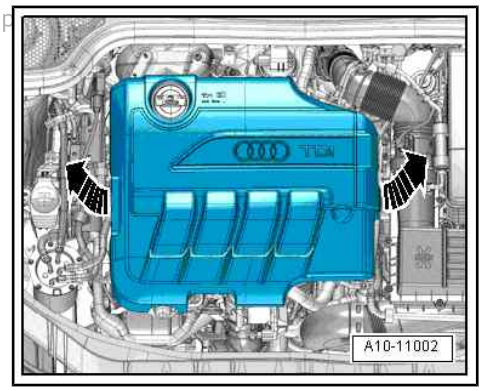
– Open hose clip -arrow-, disconnect coolant hose (bottom) leading to pump for exhaust gas recirculation cooler - V400- and drain off coolant.



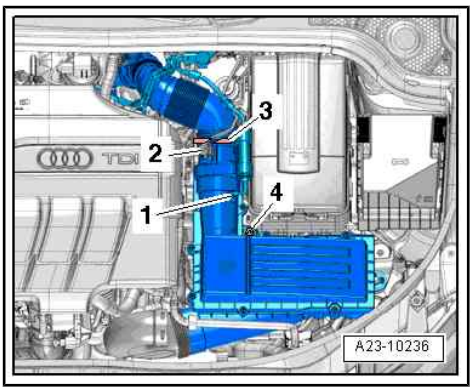
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All vehicles (continued):

– Remove engine cover panel -arrows-.



– Remove air cleaner housing ⇒ Rep. gr. 23 .

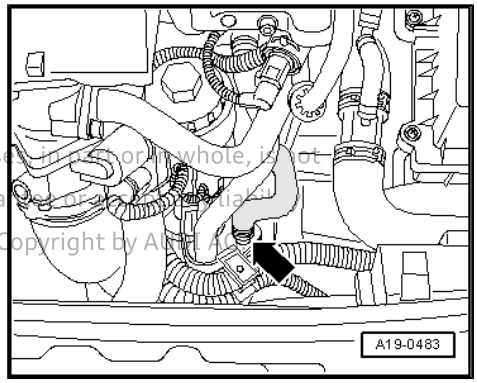


WARNING

Risk of injury as the radiator fans may start up automatically.

- *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*

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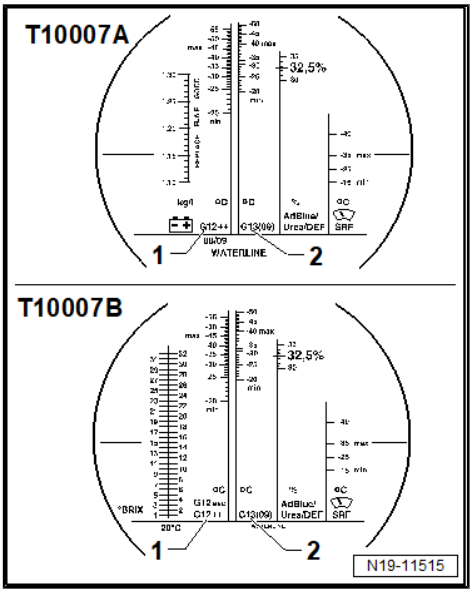


– As an additional step, open hose clip -arrow-, disconnect coolant hose at top of engine oil cooler and drain off remaining coolant.

Filling

Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.



Note

- *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious engine damage.*
- *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *Refractometer - T10007A- or refractometer - T10007B- MUST be used to determine the current level of frost protection.*
- *Scale -1- on the refractometer applies to coolant additives G12 ++ and G12evo.*
- *Scale -2- on the refractometer applies to coolant additive G13.*
- *If more than one type of coolant additive has been used: Always use the scale for G13 to determine the anti-freeze protection.*
- *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- *The temperature indicated on the refractometer corresponds to the temperature at which the first ice crystals can form in the coolant.*
- *Do not reuse coolant.*
- *Only use water/coolant additive as a lubricant for coolant hoses.*

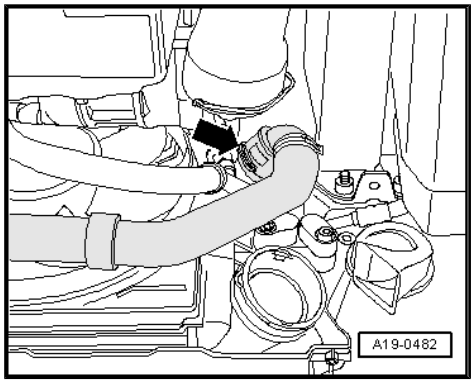
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Recommended mixture ratio for coolant

- Coolant (40 %) and distilled water (60 %) for frost protection to -25 °C
- Coolant (50 %) and distilled water (50 %) for frost protection to -36 °C
- Coolant additive ⇒ Electronic parts catalogue (ETKA)

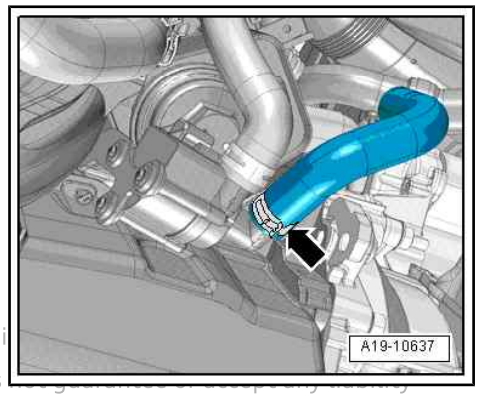
Procedure

– Connect coolant hose with plug-in connector to radiator (bottom) ⇒ page 232 .



Vehicles with pump for exhaust gas recirculation cooler - V400-

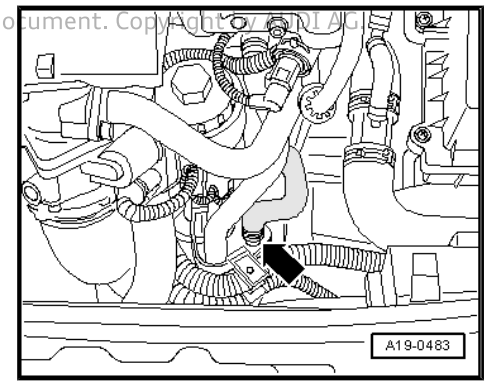
– Connect coolant hose (bottom) at pump for exhaust gas recirculation cooler - V400- -arrow-.



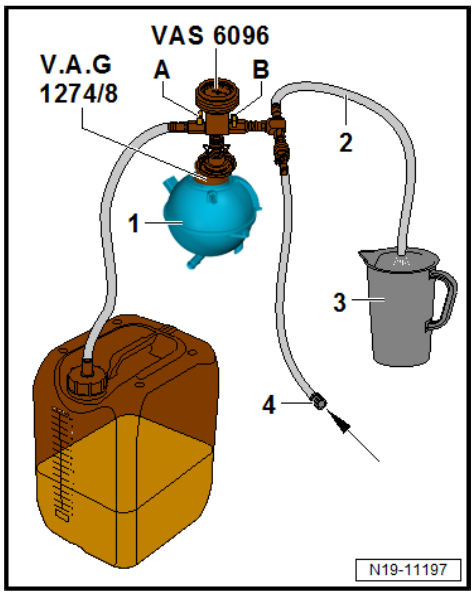
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All vehicles (continued)

– Connect coolant hose (top) to engine oil cooler -arrow-.



– Fill reservoir of -VAS 6096- with at least 8 litres of premixed coolant (according to recommended ratio):
– Fit adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
– Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
– Run vent hose -2- into a small container -3-.



Note

The vented air draws along a small amount of coolant, which should be collected.

– Close both valves -A- and -B- (turn lever at right angles to direction of flow).
– Connect hose -4- to compressed air supply.
• Pressure: 7 ... 10 bar.

– Open valve -B- by setting lever in direction of flow.

• The suction jet pump generates a partial vacuum in the cooling system; the needle on the gauge should move into the green zone.

– Also briefly open valve -A- (turn lever in direction of flow) so that hose on reservoir of -VAS 6096- can fill with coolant.

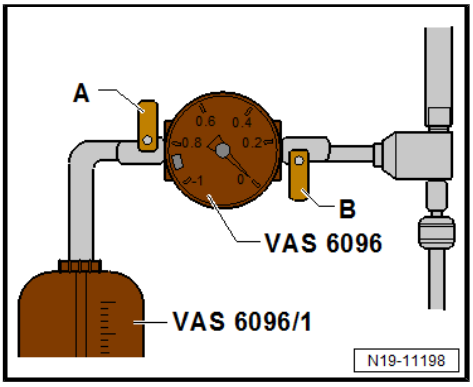
– Close valve -A- again.

– Leave valve -B- open for another 2 minutes.

• The suction jet pump continues to generate a partial vacuum in the cooling system; the needle on the gauge should remain in the green zone.

– Close valve -B-.

• The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.



Note

♦ *If the needle does not reach the green zone, repeat the process.*

♦ *Check cooling system for leaks if the vacuum is not maintained.*

– Detach compressed air hose.

– Open valve -A-.

• The vacuum in the cooling system causes the coolant to be drawn out of the reservoir of -VAS 6096- ; the cooling system is then filled.

– Detach cooling system charge unit - VAS 6096- from coolant expansion tank.

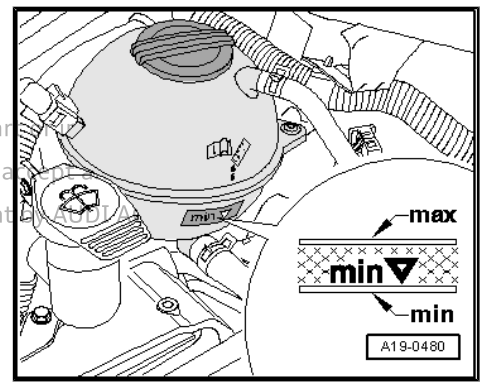
– Top up coolant to “max” mark.

– Install air cleaner housing ⇒ Rep. gr. 23 .

– Install air ducts.

– Install air hose with plug-in connector ⇒ page 270 .

– Install noise insulation ⇒ Rep. gr. 50 .



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– Start engine.

– Set temperature to “HI”.

– Switch off air conditioner compressor (press ECON button).

– Set fresh air blower to lowest setting.

– Run engine for 2 minutes (maximum) at approx. 1500 rpm.

– Top up coolant to overflow hole on expansion tank with engine running.

– Close filler cap on coolant expansion tank.

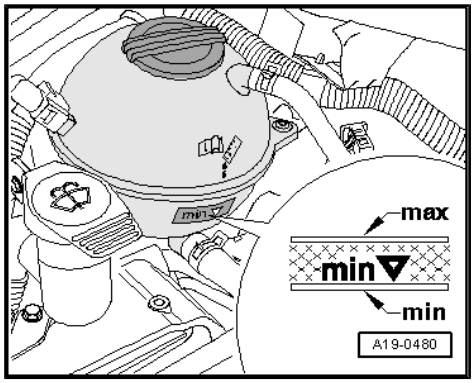
– Allow engine to run at idling speed until both large coolant hoses at radiator become warm.

– Switch off ignition and allow engine to cool down.

– Check coolant level.

- The coolant level must be between the “min” and “max” markings when the engine is cold.
- The coolant level can be at the “max” marking when the engine is warm.

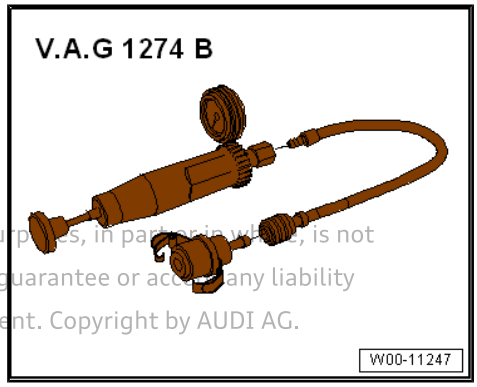
– Top up with coolant again if necessary.



1.5 Checking cooling system for leaks

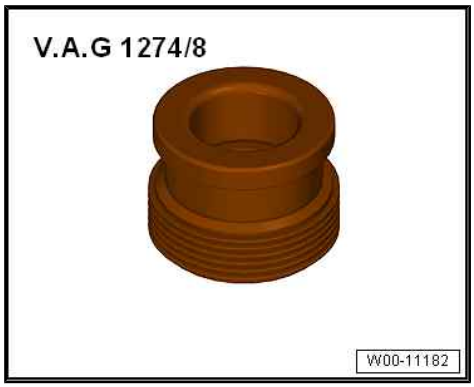
Special tools and workshop equipment required

♦ Cooling system tester - V.A.G 1274 B-

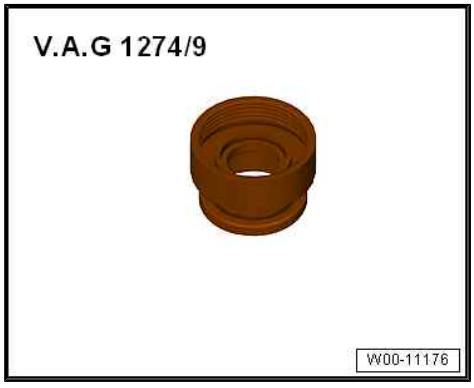


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♦ Adapter for cooling system tester - V.A.G 1274/8-

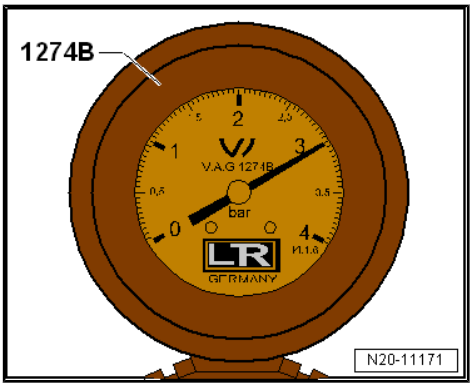


♦ Adapter for cooling system tester - V.A.G 1274/9-



- To ensure that the leak test is carried out correctly, a self-test must first be performed on the cooling system tester - V.A.G 1274 B- .

Checking cooling system tester - V.A.G 1274 B- (self-test)



– Operate cooling system tester - V.A.G 1274 B- several times.

– Build up a pressure of 3.0 bar on cooling system tester.

– Monitor pressure on pressure gauge of cooling system tester - V.A.G 1274 B- for 30 seconds.

If pressure does not build up, or if pressure dissipates again:

- Cooling system tester - V.A.G 1274 B- is leaking and must not be used.

Checking cooling system for leaks

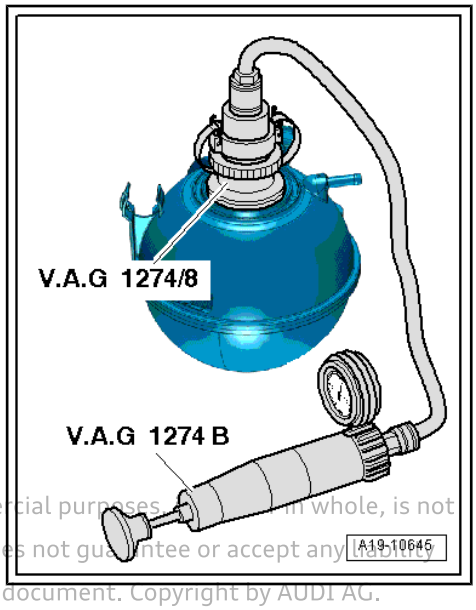
- Engine must be warm.
- Ignition switched off.

WARNING

Risk of scalding due to hot steam and hot coolant.

- ***The cooling system is under pressure when the engine is hot.***
- ***Cover filler cap on coolant expansion tank with a cloth and open carefully to dissipate pressure.***

– Open filler cap on coolant expansion tank.



– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.

– Using hand pump on cooling system tester, build up a pressure of approx. 1.5 bar.

- The pressure should not drop more than 0.2 bar within 10 minutes.
- The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder the engine is, the less the pressure will fall. If necessary, check again when the engine is cold.

If the pressure drops by more than 0.2 bar:

– Examine engine and radiator to find and eliminate the leak.

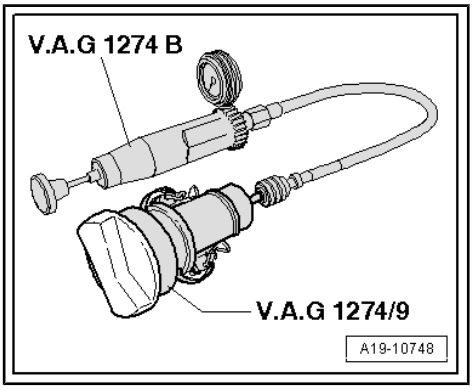
– If no leaks found:

♦ Check water-cooled charge air cooler for leaks ⇒ “3.4 Checking charge air system for leaks”, page 273 .

♦ Check exhaust gas recirculation cooler for leaks.

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Checking pressure relief valve in filler cap



– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.

– Build up pressure with hand pump on cooling system tester.

- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.

– Renew filler cap if pressure relief valve does not open as described.

2 Coolant pump and thermostat

Overview

- ⇒ “2.1 Exploded view - coolant pump and thermostat”, page 206
- ⇒ “2.2 Removing and installing coolant pump”, page 207
- ⇒ “2.3 Removing and installing thermostat”, page 207
- ⇒ “2.4 Checking thermostat”, page 209
- ⇒ “2.5 Removing and installing 4/2-way valve”, page 209

2.1 Exploded view - coolant pump and thermostat

1 - Bolt
- ❑ 15 Nm

2 - Coolant pump
- ❑ Removing and installing ⇒ page 207

3 - O-ring
- ❑ Renew

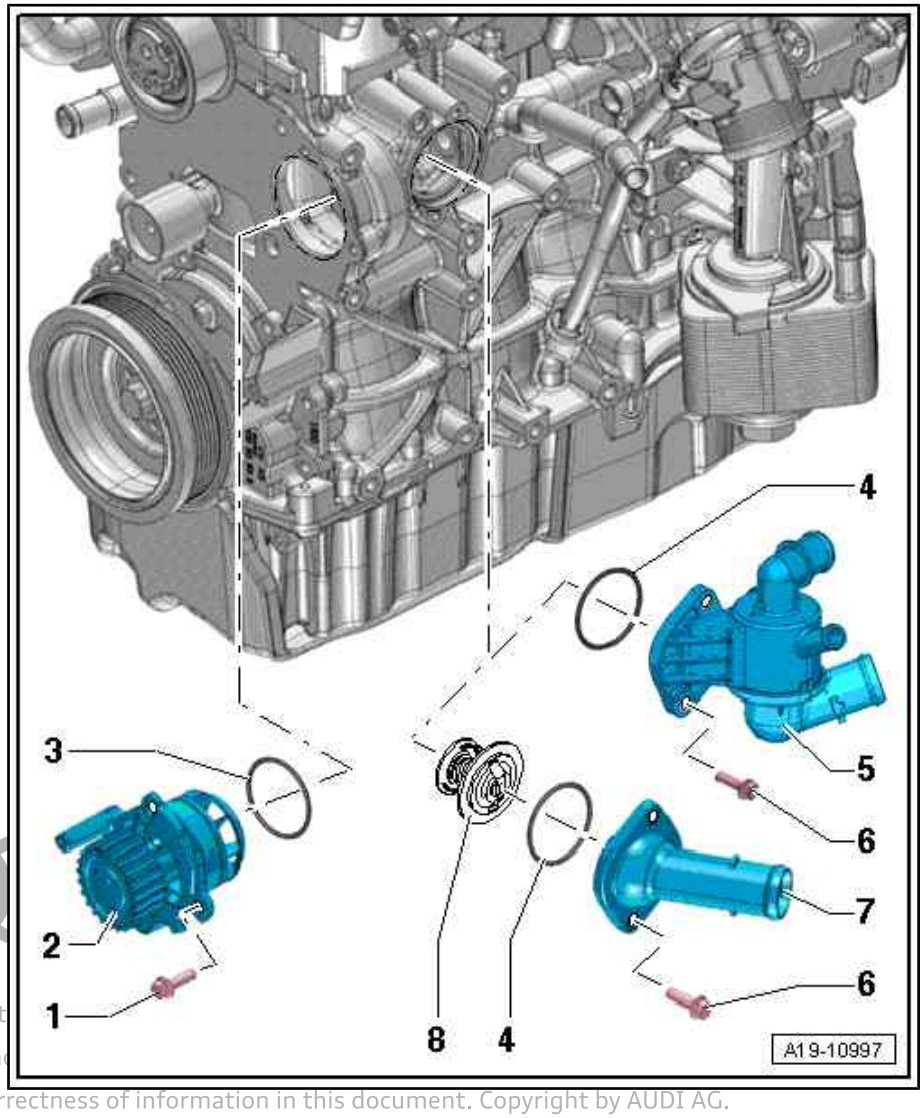
4 - O-ring
- ❑ Renew

5 - 4/2-way valve
- ❑ Installed according to version
- ❑ Removing and installing ⇒ page 209
- ❑ The thermostat is located in the interior of the 4/2-way valve and cannot be renewed separately

6 - Bolt
- ❑ 15 Nm

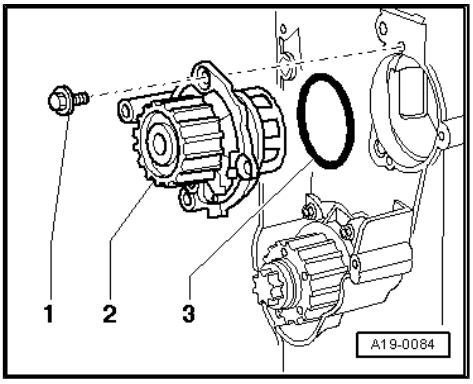
7 - Connection
- ❑ Installed according to version

8 - Thermostat
- ❑ Removing and installing ⇒ page 207
- ❑ Checking ⇒ page 209
- ❑ Only fitted on version with connection -7-



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2.2 Removing and installing coolant pump



Removing

– Drain coolant ⇒ page 196 .
– Remove toothed belt ⇒ page 103 .
– Unscrew bolts -1- and remove coolant pump -2-.
– Detach O-ring -3-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “2.1 Exploded view - coolant pump and thermostat”, page 206

Note

Fit new O-ring.

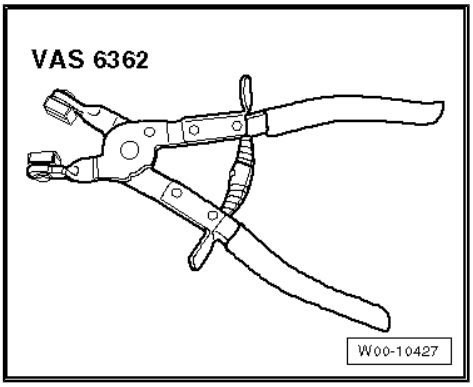
– Clean and smoothen sealing surface for O-ring.
– Lightly lubricate O-ring -3- with coolant.
– Fit coolant pump -2-.
• Installation position: Sealing plug in housing faces downwards.
– Install toothed belt (adjust valve timing) ⇒ page 110 .
– Fill up with coolant ⇒ page 200 .

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2.3 Removing and installing thermostat

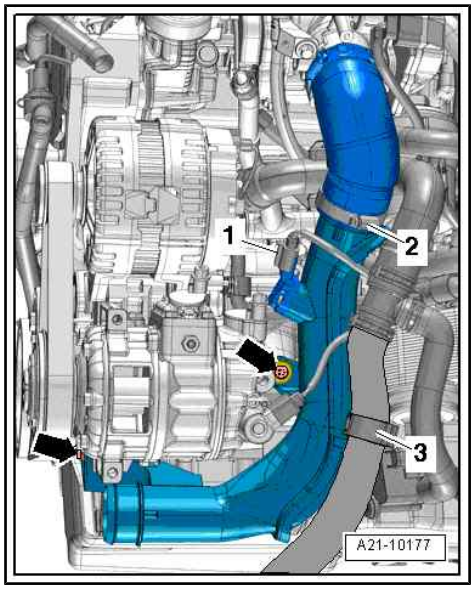
Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



Removing

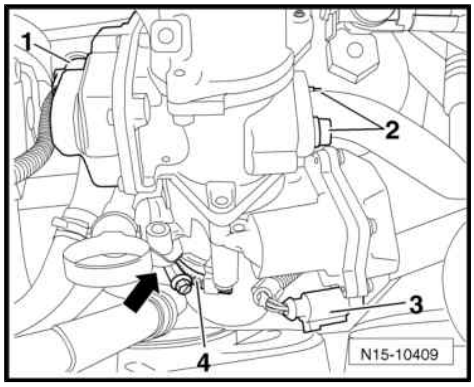
– Drain coolant ⇒ page 196 .
– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe (front).



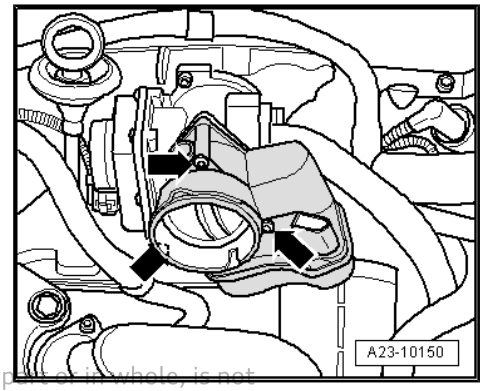
– Unplug electrical connector -3- at intake manifold flap motor - V157- .
– Release hose clip -4- and disconnect air hose from intake manifold flap motor - V157- .
– Remove bolt -arrow- for dipstick guide tube.

Note

Disregard items -1 and 2-.

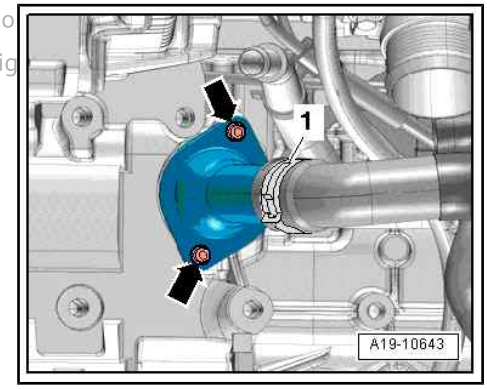


– Unscrew bolts -arrows- and detach intake manifold flap motor - V157- .



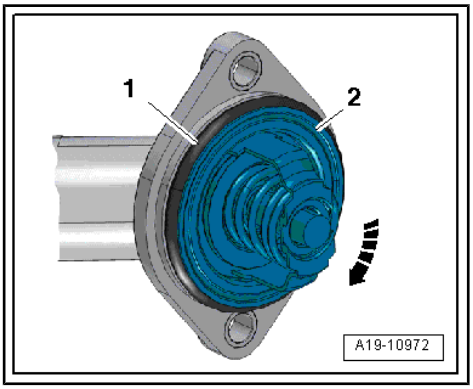
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– Release hose clip and detach coolant hose -1- from connection.
– Unscrew bolts -arrows- and remove connection.



– Turn thermostat -2- approx. 15° clockwise -arrow- and take thermostat out of connection.

– Detach O-ring -1-.



Installing

Installation is carried out in reverse order; note the following:

- Tightening torque
  ⇒ "2.1 Exploded view - coolant pump and thermostat", page 206

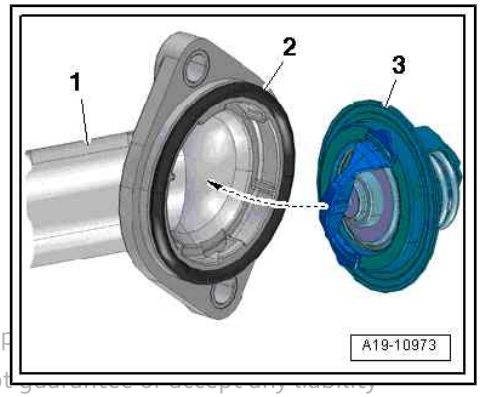
Note

Fit new O-ring.

– Clean and smoothen sealing surface for O-ring.

– Lubricate O-ring with coolant.

– Fit thermostat -3- with O-ring -2- into guide at connection -1-.



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– Turn thermostat -1- anti-clockwise -arrow- as far as stop.

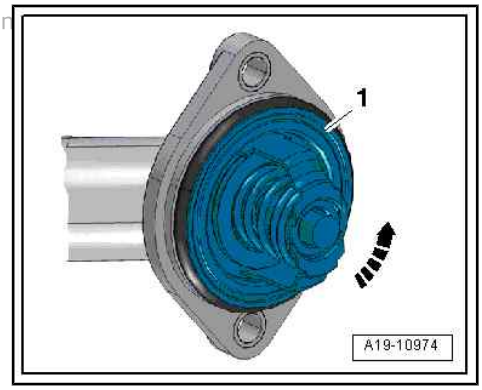
– Install intake manifold flap motor - V157- ⇒ Rep. gr. 23 .

– Install air pipe (front) ⇒ page 268 .

– Install air hose with plug-in connector ⇒ page 270 .

– Install radiator cowl ⇒ page 234 .

– Fill up with coolant ⇒ page 200 .



2.4 Checking thermostat

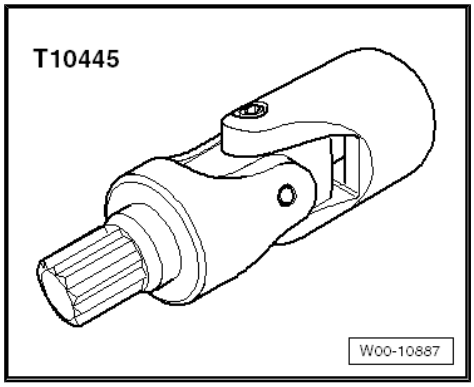
– Remove thermostat and heat it in a water bath.

Starts to open	Fully open	Opening travel
approx. 92 °C	approx. 107 °C [1)]	at least 7 mm
• [1)] Cannot be tested.		

2.5 Removing and installing 4/2-way valve

Special tools and workshop equipment required

♦ Multi-point bit XZN 8 - T10445-

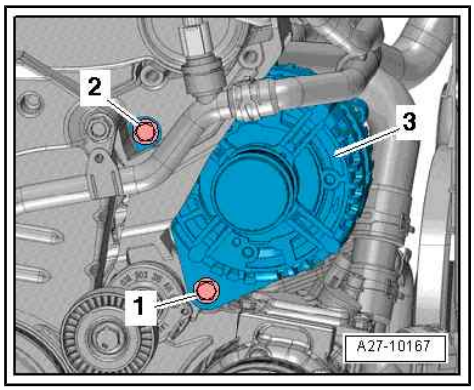


Removing

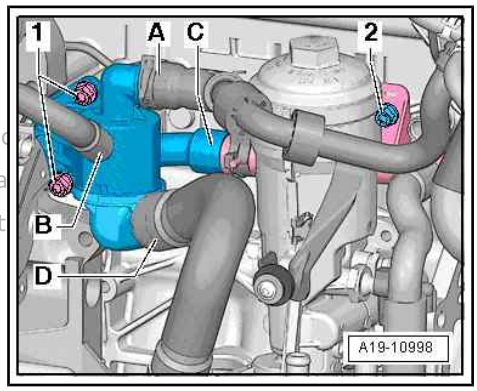
Note

The thermostat is located in the interior of the 4/2-way valve and cannot be renewed separately.

– Drain coolant ⇒ page 196 .
– Remove alternator ⇒ Electrical system; Rep. gr. 27 .
– Remove throttle valve module - J338- ⇒ Rep. gr. 23 .



– Detach coolant hoses from connections -A, B and D-.
– Remove bolt -2- with multi-point bit XZN 8 - T10445- .
– Remove bolts -1-.
– Pull valve out of cylinder block and detach connection -C- from coolant pipe to the left.



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Installing

Installation is carried out in reverse order; note the following:

• Tightening torque
⇒ “2.1 Exploded view - coolant pump and thermostat”, page 206

Note

Fit new O-ring.

– Install throttle valve module - J338- ⇒ Rep. gr. 23 .
– Install alternator ⇒ Electrical system; Rep. gr. 27 .

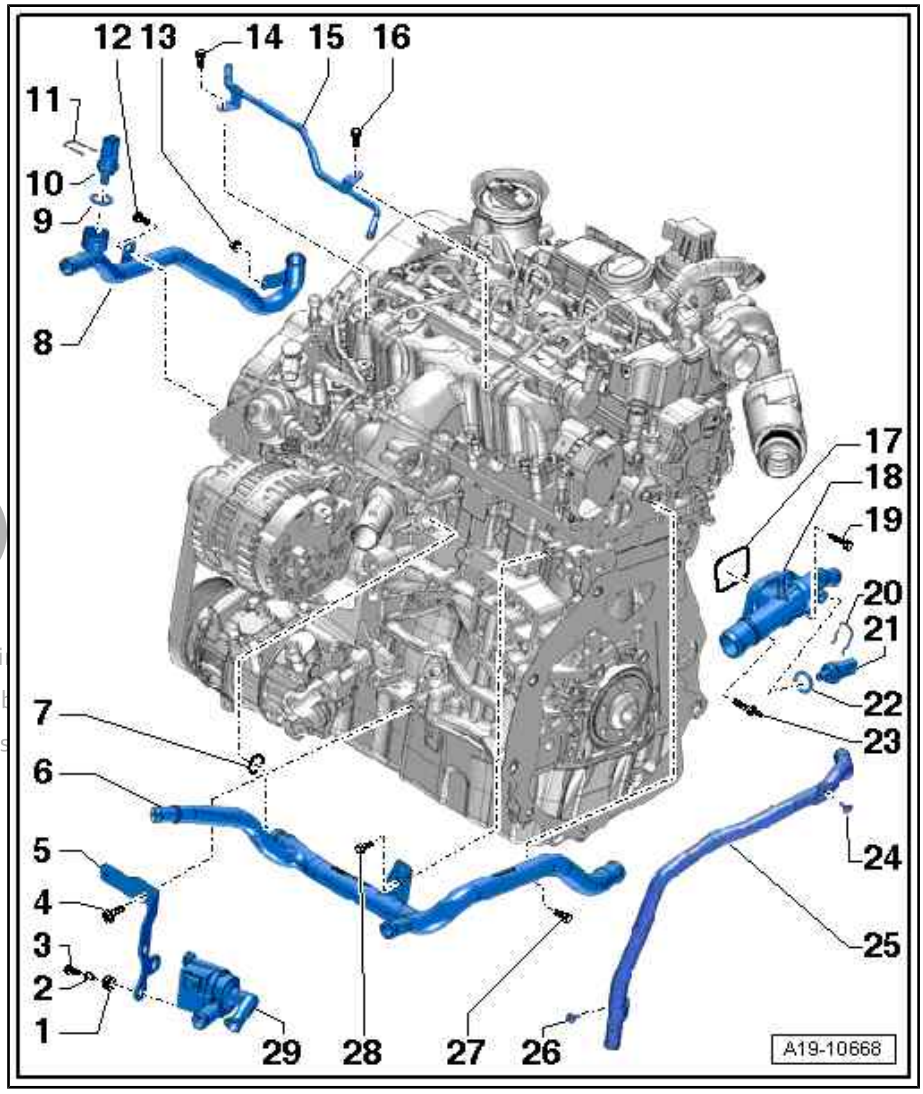
3 Coolant pipes, coolant temperature senders, pump for exhaust gas recirculation cooler

Overview

- ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, pump for exhaust gas recirculation cooler”, page 211
- ⇒ “3.2 Removing and installing coolant temperature sender G62 ”, page 213
- ⇒ “3.3 Removing and installing radiator outlet coolant temperature sender G83 - vehicles with engine codes CBAA, CBAB, CBBB”, page 215
- ⇒ “3.4 Removing and installing radiator outlet coolant temperature sender G83 - vehicles with engine code CBEA”, page 217
- ⇒ “3.5 Removing and installing pump for exhaust gas recirculation cooler V400 ”, page 217
- ⇒ “3.6 Removing and installing coolant pipe (front)”, page 220
- ⇒ “3.7 Removing and installing coolant pipe (left-side)”, page 224
- ⇒ “3.8 Removing and installing coolant pipe (right-side)”, page 227

3.1 Exploded view - coolant pipes, coolant temperature senders, pump for exhaust gas recirculation cooler

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1 - Grommet

- ❑ Not available as separate part

2 - Sleeve

- ❑ Not available as separate part

3 - Bolt

- ❑ 2.7 Nm

4 - Bolt

- ❑ 40 Nm

5 - Bracket

- ❑ For pump for exhaust gas recirculation cooler - V400-

6 - Coolant pipe (front)

- ❑ Removing and installing ⇒ page 220

7 - O-ring

- ❑ Renew

8 - Coolant pipe (right-side)

- ❑ Removing and installing ⇒ page 227

9 - O-ring

- ❑ Renew

10 - Radiator outlet coolant temperature sender - G83-

- ❑ Removing and installing ⇒ page 215

11 - Retaining clip

12 - Bolt

- ❑ 9 Nm

13 - Nut

- ❑ 9 Nm

14 - Bolt

- ❑ 9 Nm

15 - Coolant pipe

16 - Bolt

- ❑ 9 Nm

17 - Gasket

- ❑ Renew

18 - Connection

19 - Bolt

- ❑ 9 Nm

20 - Retaining clip

21 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ page 213

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22 - O-ring
- ❑ Renew

23 - Centre hex stud
- ❑ 9 Nm

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24 - Bolt
- ❑ 9 Nm

25 - Coolant pipe (left-side)
- ❑ Removing and installing ⇒ page 224

26 - Bolt
- ❑ 9 Nm

27 - Bolt
- ❑ 40 Nm

28 - Bolt
- ❑ 13 Nm

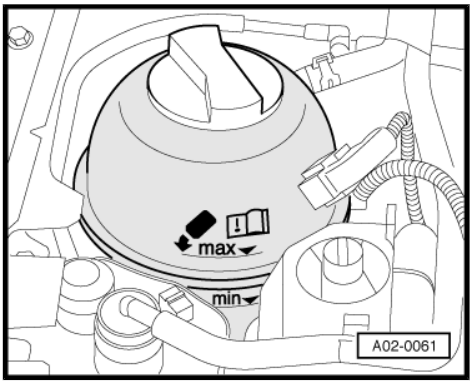
29 - Pump for exhaust gas recirculation cooler - V400-
- ❑ Removing and installing ⇒ page 217

3.2 Removing and installing coolant temperature sender - G62-

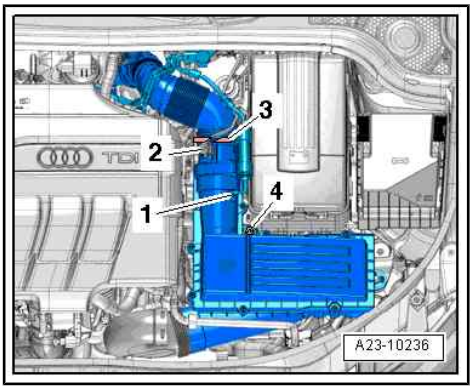
Removing

- Engine cold.

– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

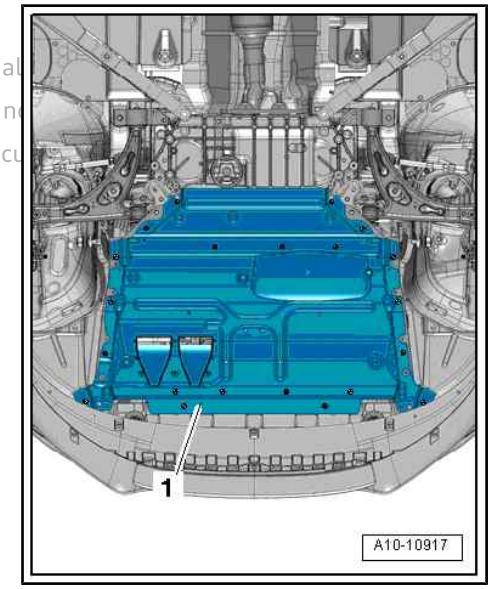


– Remove air cleaner housing ⇒ Rep. gr. 23 .

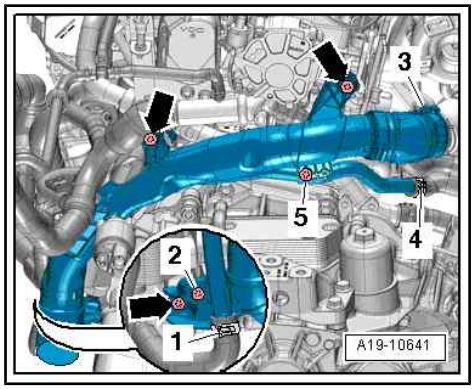


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– Remove noise insulation -1- ⇒ Rep. gr. 50 .



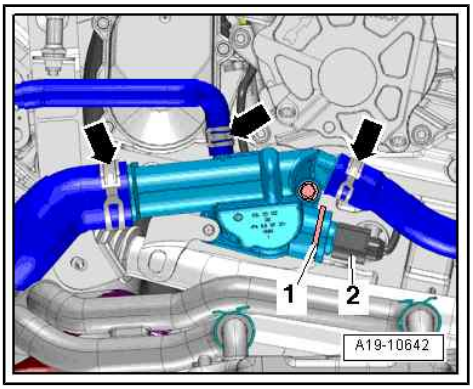
– Remove bolts -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Release hose clip -3- and push air pipe (left-side) with coolant pipe towards the left.



Note

Disregard -items 1, 2, 4, 5-.

– Unplug electrical connector -2- at coolant temperature sender - G62- .



Note

Place a cloth underneath the connection to catch escaping coolant.

– Pull off retaining clip -1- and pull coolant temperature sender - G62- out of connection.

Note

Disregard -arrows-.

Installing

Installation is carried out in reverse order; note the following:

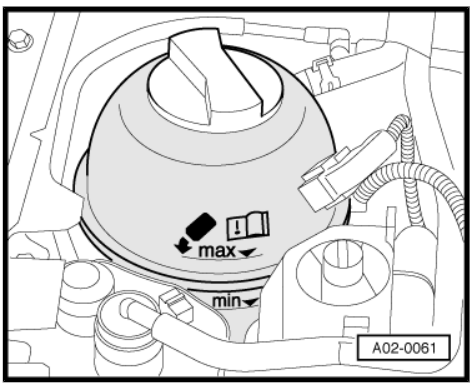
Note

- *Fit new O-rings.*
- *To avoid loss of coolant, insert new coolant temperature sender - G62- immediately into connection.*

– Install air pipe (left-side) ⇒ page 268 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Check coolant level ⇒ page 204 .

3.3 Removing and installing radiator outlet coolant temperature sender - G83- - vehicles with engine codes CBAA, CBAB, CBBB

Removing

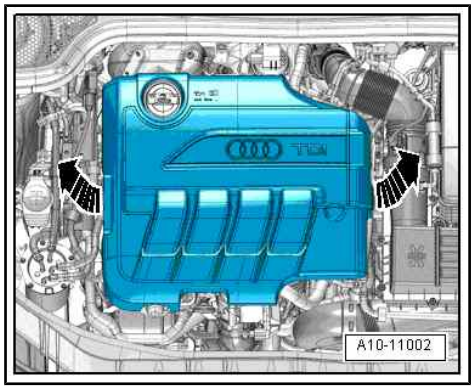


- Engine cold.

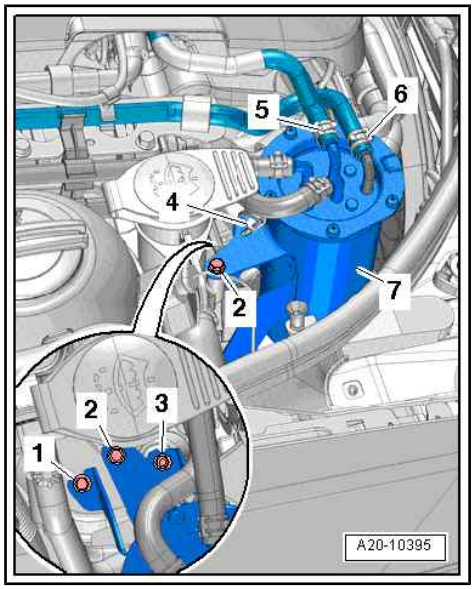
– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

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– Remove engine cover panel -arrows-.

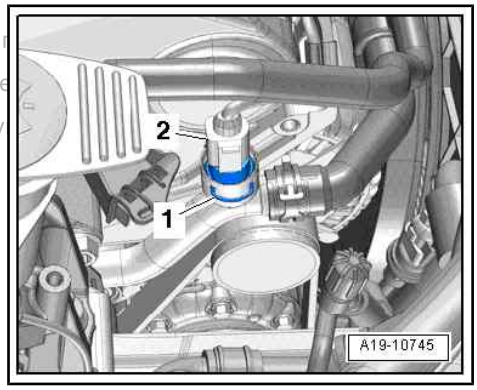


– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach hose retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



– Unplug electrical connector -2- at radiator outlet coolant temperature sender - G83- .

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Note

Place a cloth underneath to catch escaping coolant.

– Pull off retaining clip -1- and pull radiator outlet coolant temperature sender - G83- out of connection on coolant pipe.

Installing

Installation is carried out in reverse order; note the following:

Note

- *Fit new O-ring.*
- *To avoid loss of coolant, fit new radiator outlet coolant temperature sender - G83- into coolant pipe immediately.*

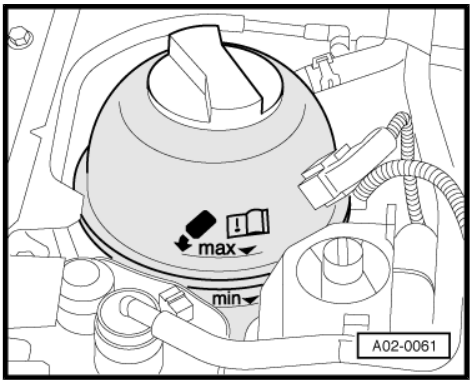
– Install fuel filter ⇒ Rep. gr. 20 .
– Check coolant level ⇒ page 204 .

3.4 Removing and installing radiator outlet coolant temperature sender - G83- - vehicles with engine code CBEA

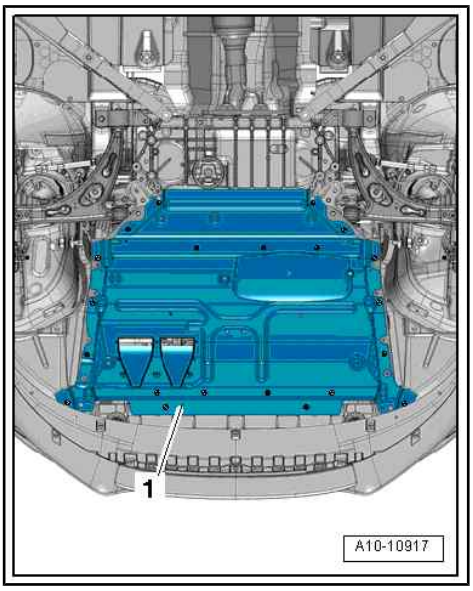
Removing

- Engine cold.

– Open filler cap on coolant expansion tank briefly and allow residual pressure in cooling system to dissipate.

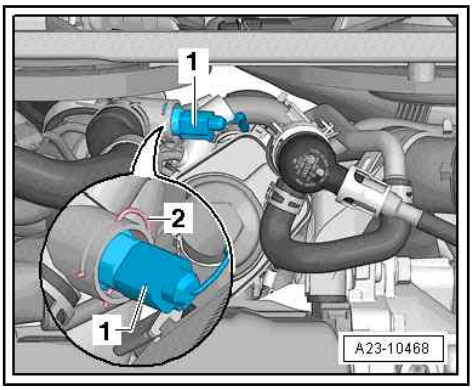


– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– Unplug electrical connector -1- at radiator outlet coolant temperature sender - G83- .

– Pull off retaining clip -2- and pull radiator outlet coolant temperature sender - G83- out of connection on coolant pipe.



Installing

Installation is carried out in reverse order; note the following:

Note

- *Fit new O-ring.*
- *To avoid loss of coolant, fit new radiator outlet coolant temperature sender - G83- into coolant pipe immediately.*

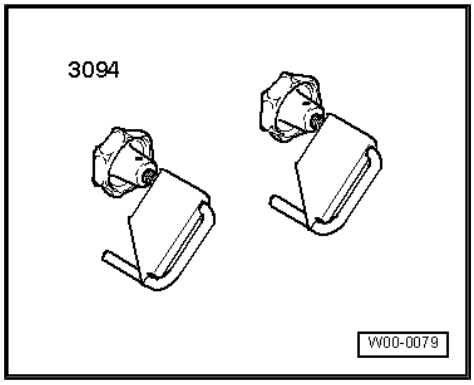
– Check coolant level ⇒ page 204 .

3.5 Removing and installing pump for exhaust gas recirculation cooler - V400-

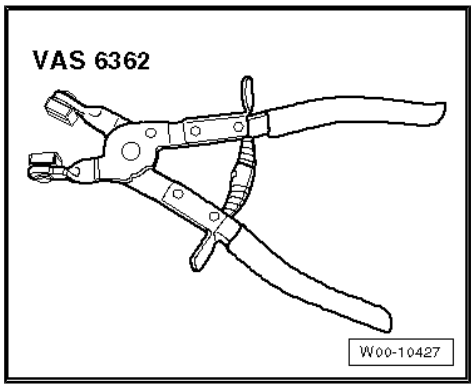
Special tools and workshop equipment required

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♦ Hose clamps up to 25 mm - 3094-



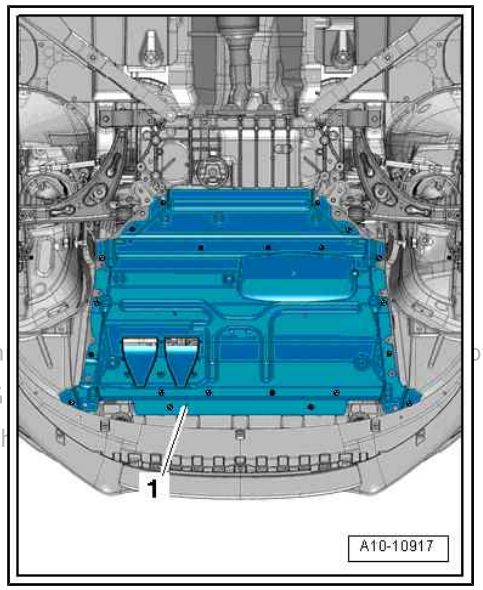
♦ Hose clip pliers - VAS 6362-



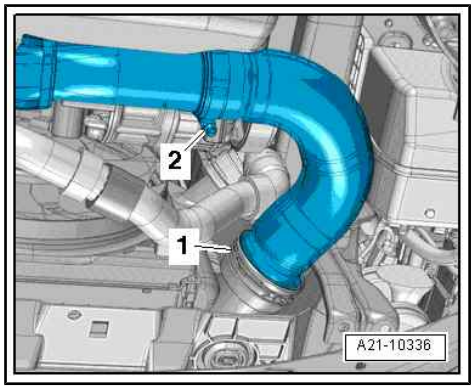
Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

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– Release hose clip -2-, lift retaining clip -1- and remove air hose.



WARNING

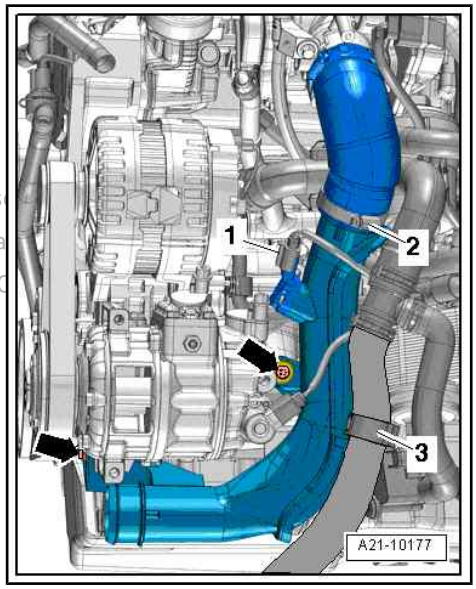
Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

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– Remove bolts -arrows-.

– Release hose clip -2- and push front air pipe towards the right.

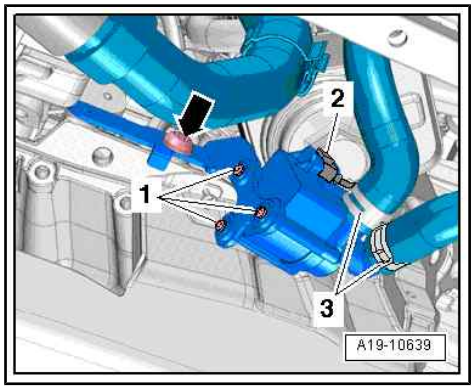


Note

Disregard items -1 and 3-.

Note

Place a cloth underneath pump for exhaust gas recirculation cooler - V400- to catch escaping coolant.



- Clamp off coolant hoses using hose clamps -3094- , release hose clips -3- and disconnect coolant hoses.
- Unplug electrical connector -2-.
- Unscrew bolts -1- and remove pump for exhaust gas recirculation cooler - V400- .

Note

Disregard -arrow-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

- ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, pump for exhaust gas recirculation cooler”, page 211

Note

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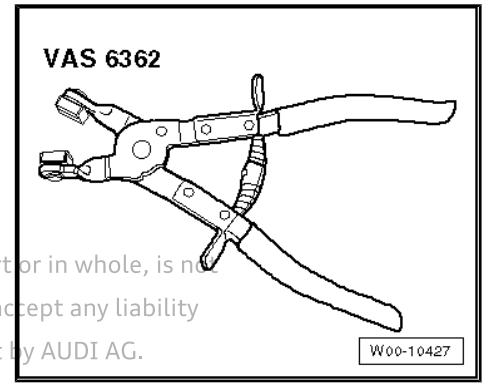
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

- Install air pipe (front) ⇒ page 268 .
- Install air hose with plug-in connector ⇒ page 270 .
- Install noise insulation ⇒ Rep. gr. 50 .
- Check coolant level ⇒ page 204 .

3.6 Removing and installing coolant pipe (front)

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-

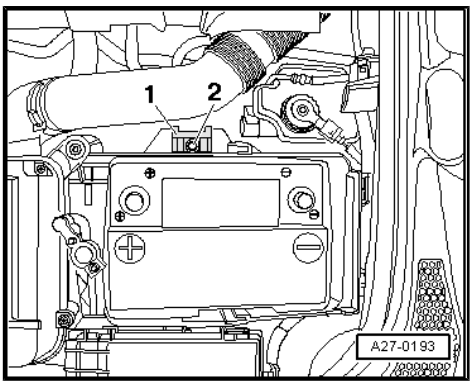


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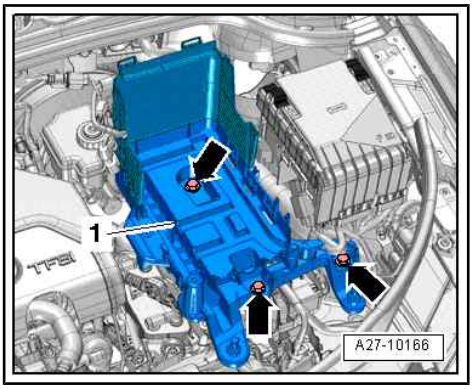
Removing

– Remove oil filter bracket ⇒ page 180 .

– Remove battery ⇒ Electrical system; Rep. gr. 27 .



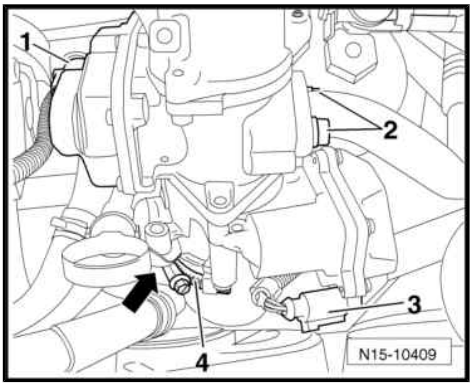
– Remove bolts -arrows- and take out battery tray -1-.



– Unplug electrical connector -3- at intake manifold flap motor - V157- or throttle valve module - J338- .

– Release hose clip -4- and detach air hose.

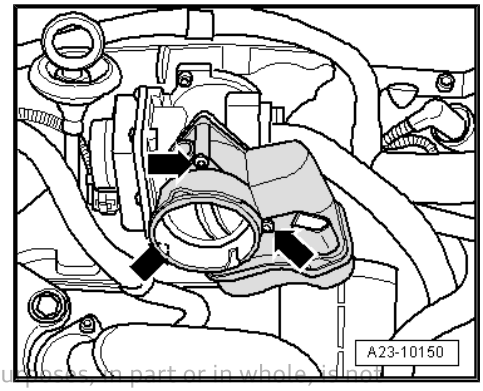
– Remove bolt -2- on exhaust gas recirculation pipe.



Note

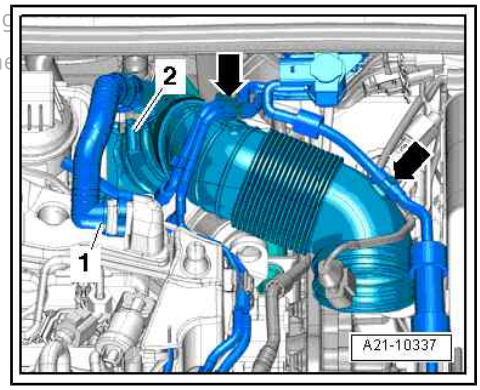
Disregard -item 1- and -arrow-.

– Unscrew bolts -arrows- and detach intake manifold flap motor - V157- or throttle valve module - J338- .

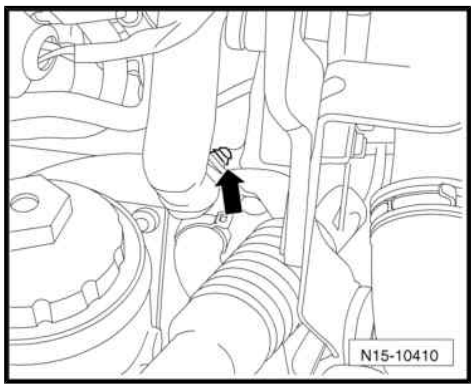


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– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows- at air pipe.
– Loosen hose clip -2- and detach air pipe.

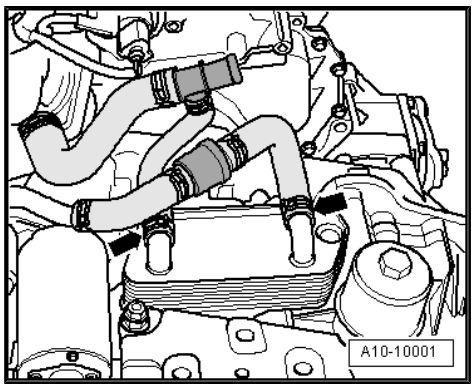


– Unclip wiring harness from retainer -arrow-.



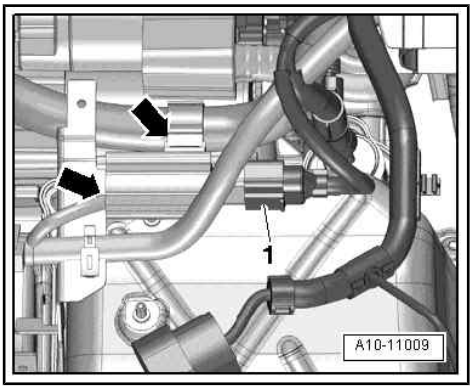
Vehicles with dual clutch gearbox:

– Slacken hose clips -arrows- and detach coolant hoses from gear oil cooler.



All vehicles (continued):

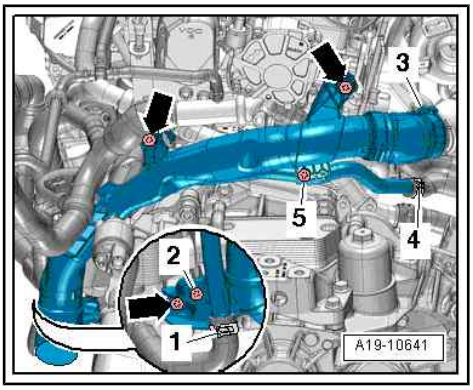
– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.



– Remove bolts -2, 5- and -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Loosen hose clip -3- and detach air pipe (left-side).

Note

Disregard items -1 and 4-.

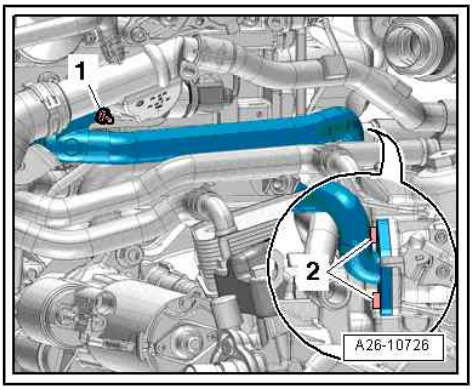


Caution

Risk of cracking in flexible joint.

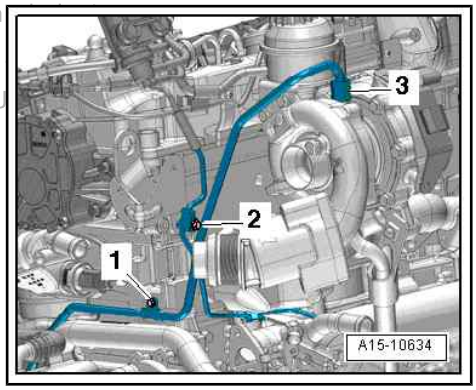
- ***Do not bend flexible joint in exhaust gas recircuation pipe.***

– Remove nut -1- and bolts -2-, detach exhaust gas recirculation pipe.

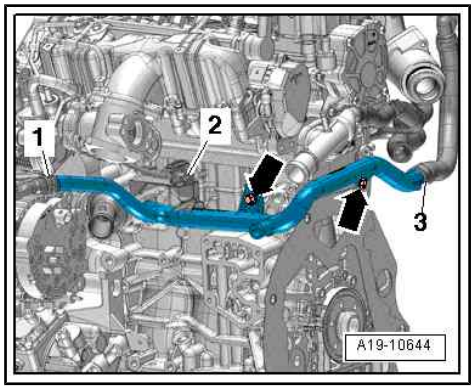


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– Remove nut -2- at retaining clip for vacuum line.
– Remove bolt -1-.
– Unscrew oil supply line from connection on turbocharger. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut -3-.



– Remove electrical connector -2- for Hall sender - G40- from bracket and unplug connector.
– Detach bracket from coolant pipe (front).
– Release hose clips -1- and -3- and disconnect coolant hoses.
– Remove bolts -arrows- and detach coolant pipe (front) from left side of cylinder block.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

- ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, pump for exhaust gas recirculation cooler”, page 211
- ⇒ “2.1 Exploded view - oil filter bracket and engine oil cooler”, page 178

Note

- *Renew gaskets, seals and O-rings.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

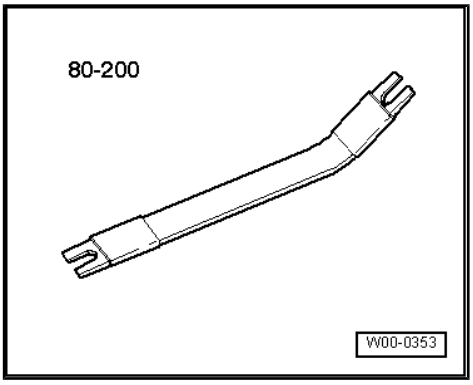
– Clean and smoothen sealing surface for O-ring.
– Lightly lubricate O-ring with coolant and slide O-ring onto coolant pipe (front).
– Push coolant pipe (front) into cylinder block.
– Install oil supply line ⇒ Item 6 (page 178) .
– Install exhaust gas recirculation pipe ⇒ page 297 .
– Install air pipe (left-side) ⇒ page 268 .
– Install intake manifold flap motor - V157- or throttle valve module - J338- ⇒ Rep. gr. 23 .
– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .
– Install oil filter bracket ⇒ page 180 .
– Fill up with coolant ⇒ page 200 .

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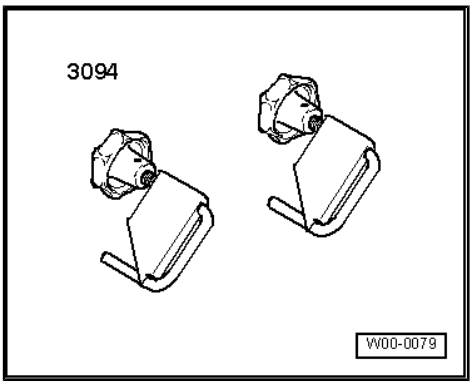
3.7 Removing and installing coolant pipe (left-side)

Special tools and workshop equipment required

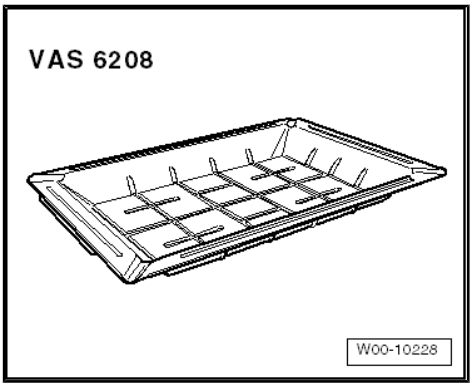
- Removal lever - 80 - 200-



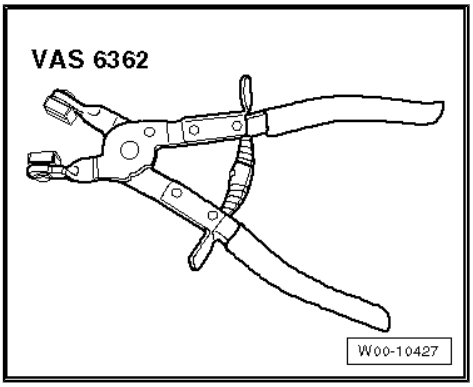
- Hose clamps up to 25 mm - 3094-



- Drip tray for workshop hoist - VAS 6208-



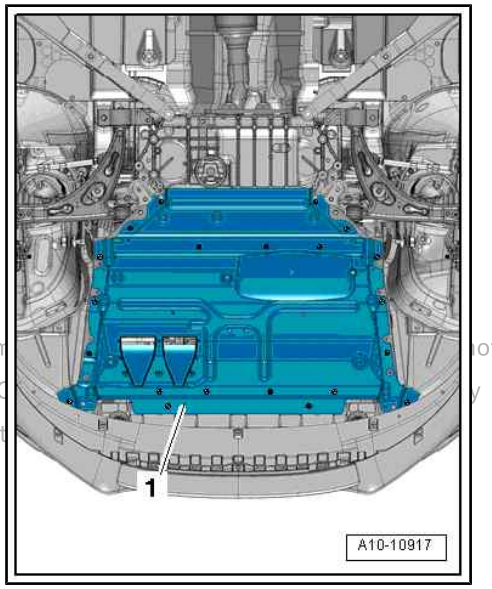
- Hose clip pliers - VAS 6362-



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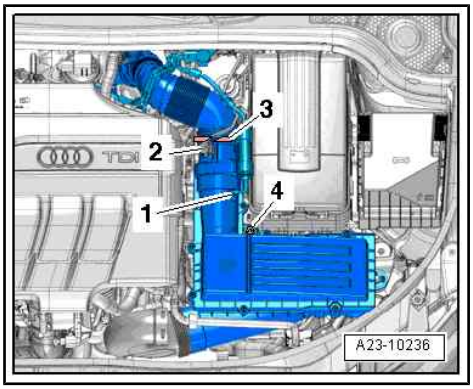
Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



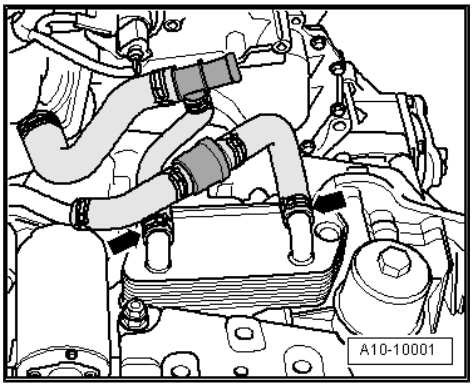
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– Remove air cleaner housing ⇒ Rep. gr. 23 .



Vehicles with dual clutch gearbox:

– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect coolant hoses from gear oil cooler.



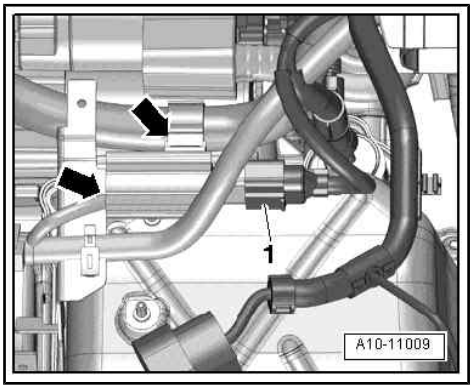
All vehicles (continued):

WARNING

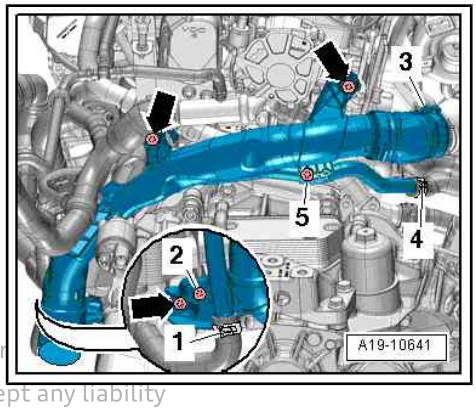
Risk of injury as the radiator fans may start up automatically.

- *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*

– Move clear wiring harnesses -arrows- and electrical connector -1- at bracket.



– Remove bolts -2, 5- and -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Loosen hose clip -3- and detach air pipe (left-side).
– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -1- and -4- and disconnect coolant hoses from coolant pipe (left-side).
– Detach coolant pipe (left-side).



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Installing

Installation is carried out in reverse order; note the following:

Tightening torque

- ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, pump for exhaust gas recirculation cooler”, page 211

Note

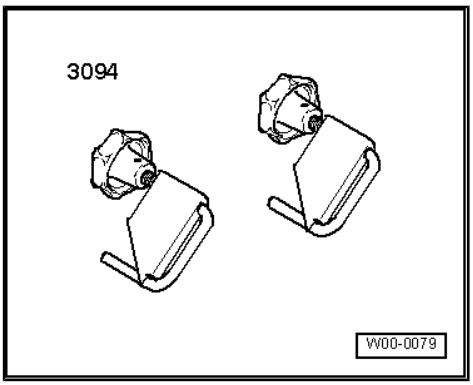
Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install air pipe (left-side) ⇒ page 268 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Fill up with coolant ⇒ page 200 .

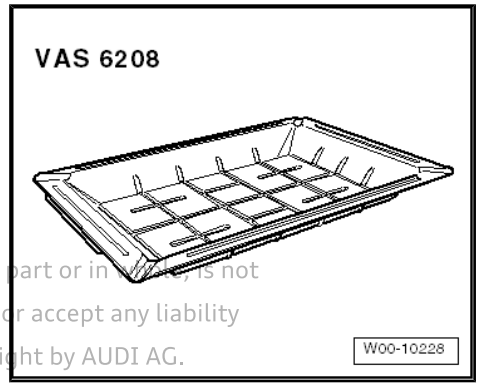
3.8 Removing and installing coolant pipe (right-side)

Special tools and workshop equipment required

♦ Hose clamps up to 25 mm - 3094-

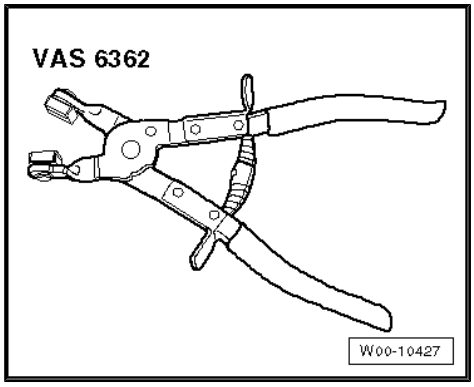


♦ Drip tray for workshop hoist - VAS 6208-



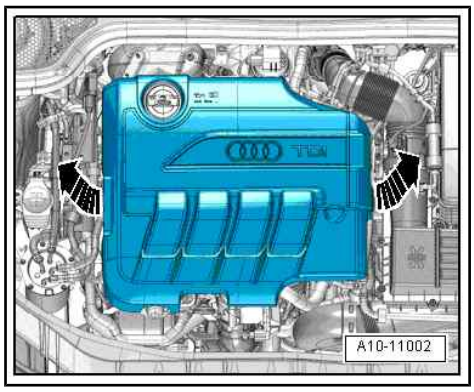
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♦ Hose clip pliers - VAS 6362-

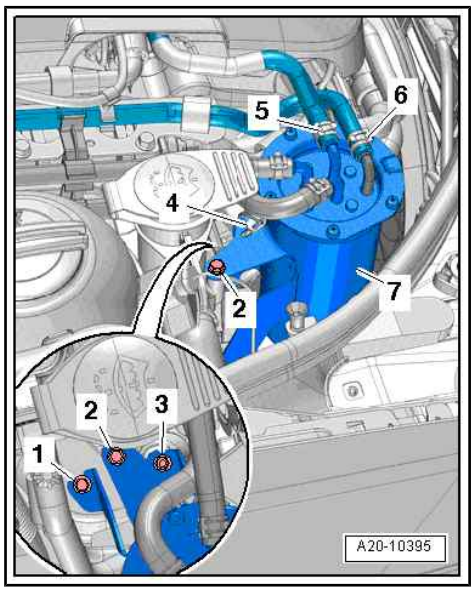


Removing

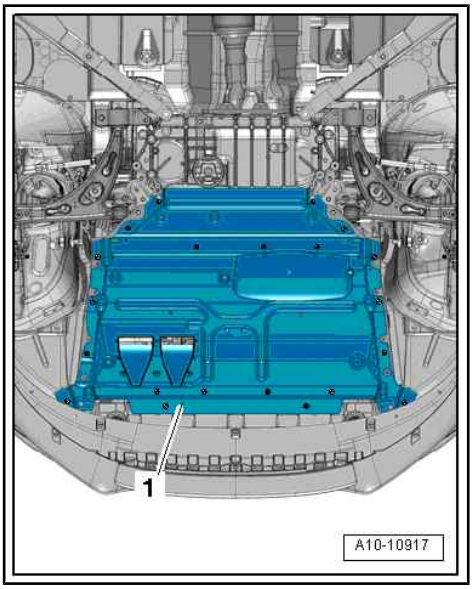
– Remove engine cover panel -arrows-.



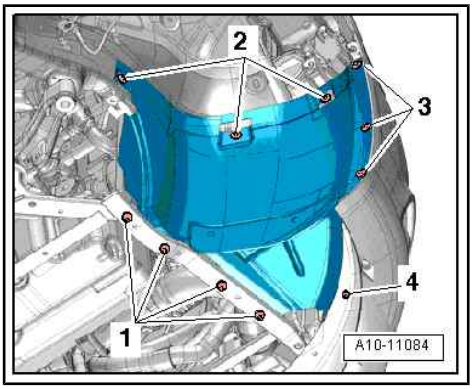
– Loosen bolt -1-.
– Remove bolt -2- and nut -3-.
– Detach hose retainer -4- from fuel filter, move fuel filter -7- clear to one side with fuel hoses -5- and -6- connected.



– Remove noise insulation -1- ⇒ Rep. gr. 50 .

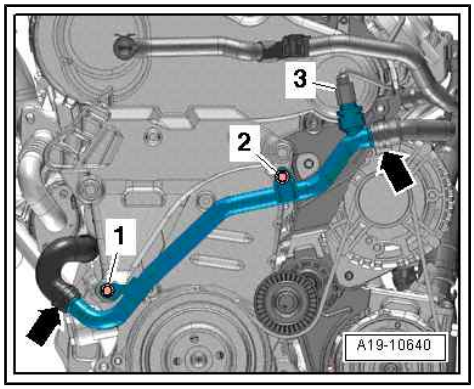


– Remove front wheel housing liner (front section, right-side) ⇒ Rep. gr. 66 .



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– Place drip tray for workshop hoist - VAS 6208- beneath engine.
– Unplug electrical connector -3- at radiator outlet coolant temperature sender - G83- .
– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect coolant hoses from coolant pipe (right-side).
– Remove nut -1- and bolt -2- and take off coolant pipe (right-side).



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

◆ ⇒ “3.1 Exploded view - coolant pipes, coolant temperature senders, pump for exhaust gas recirculation cooler”, page 211

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .

– Install front section of wheel housing liner (front) ⇒ Rep. gr. 66 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Install fuel filter ⇒ Rep. gr. 20 .
– Check coolant level ⇒ page 204 .

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4 Radiator and radiator fans

Overview

- ⇒ “4.1 Exploded view - radiator and radiator fans”, page 231
- ⇒ “4.2 Removing and installing radiator”, page 232
- ⇒ “4.3 Removing and installing radiator cowl”, page 234
- ⇒ “4.4 Removing and installing radiator fans V7 and V177 ”, page 236

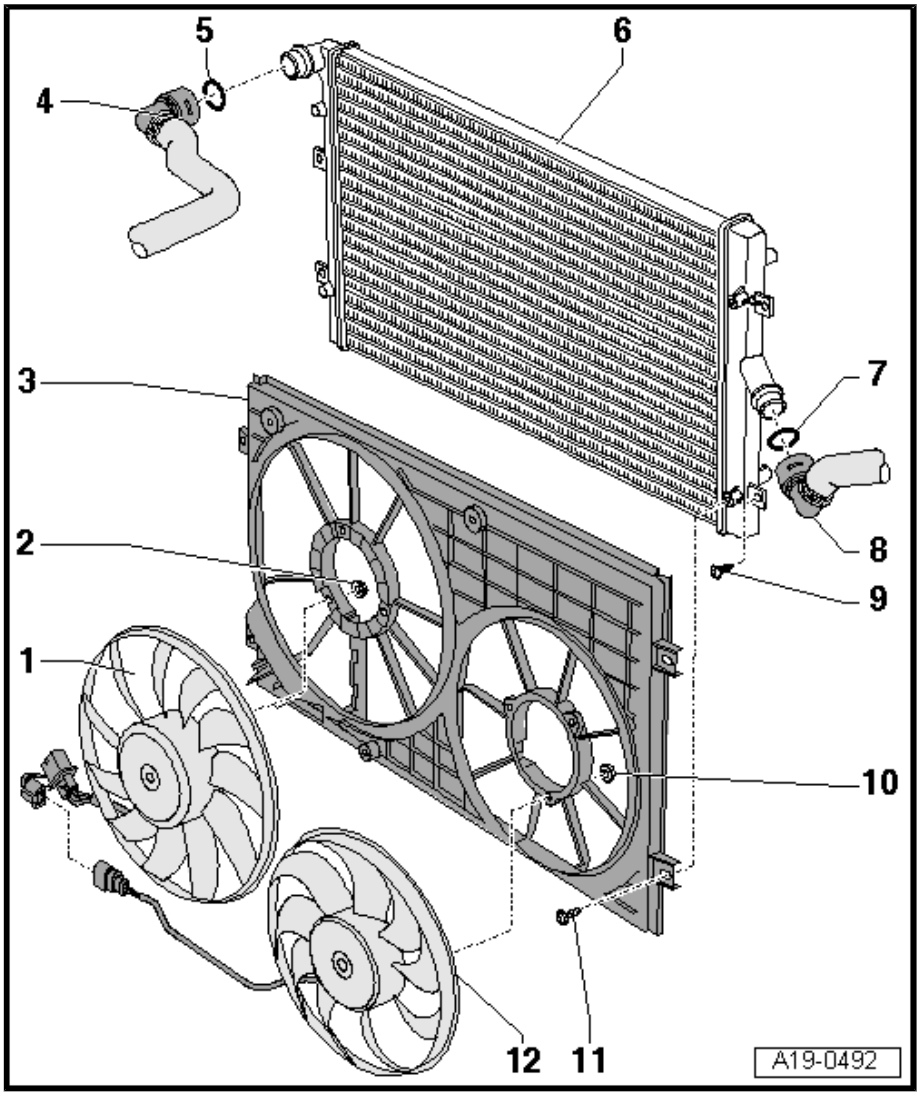
WARNING

Risk of injury as the radiator fans may start up automatically.

- *Unplug electrical connectors before working in vicinity of radiator cowl.*

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4.1 Exploded view - radiator and radiator fans



1 - Radiator fan - V7-
- ❑ With radiator fan control unit - J293-
- ❑ Removing and installing ⇒ page 236

2 - Nut
- ❑ 5 Nm

3 - Radiator cowl
- ❑ Removing and installing ⇒ page 234

4 - Coolant hose (top)
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 232

5 - O-ring
- ❑ Renew if damaged
- ❑ Lubricate with coolant

6 - Radiator
- ❑ Removing and installing ⇒ page 232
- ❑ If renewed, refill system with fresh coolant

7 - O-ring
- ❑ Renew if damaged
- ❑ Lubricate with coolant

8 - Coolant hose (bottom)
- ❑ Lift retaining clip to detach
- ❑ Connecting to radiator ⇒ page 232

9 - Bolt
- ❑ 5 Nm

10 - Nut

❑ 5 Nm

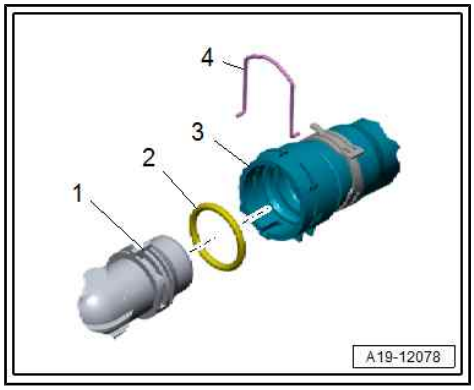
11 - Bolt

❑ 5 Nm

12 - Radiator fan 2 - V177-

❑ Removing and installing ⇒ page 236

Connecting coolant hose with plug-in connector



- If damaged, renew retaining clip -4-.

– If damaged, renew O-ring. To do so, remove O-ring -2- from plug-in connector -3- using a suitable tool (do not use a sharp tool). Take care not to damage the plug-in connector or the surface on which the O-ring is seated.

– Lightly lubricate new O-ring with coolant and fit O-ring in coolant hose.

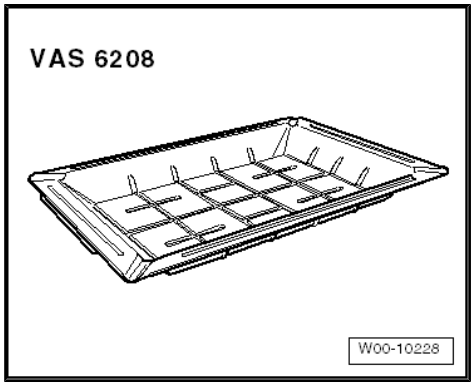
– Press coolant hose onto connection -1- until it engages audibly.

– Press coolant hose in again and then pull to check that plug-in connector is correctly engaged.

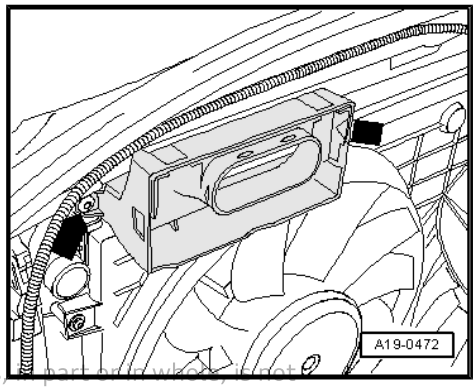
4.2 Removing and installing radiator

Special tools and workshop equipment required

♦ Drip tray for workshop hoist - VAS 6208-



Removing



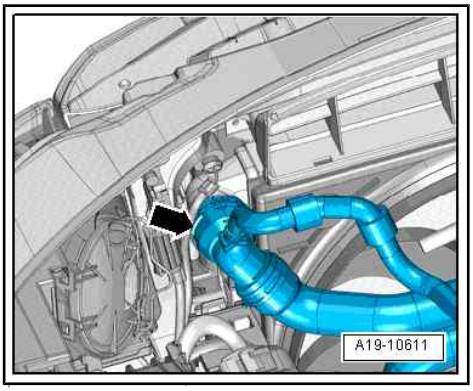
– Drain coolant ⇒ page 196 .

– Remove radiator cowl ⇒ page 234 .

– Remove bolts -arrows- and detach air duct from lock carrier.

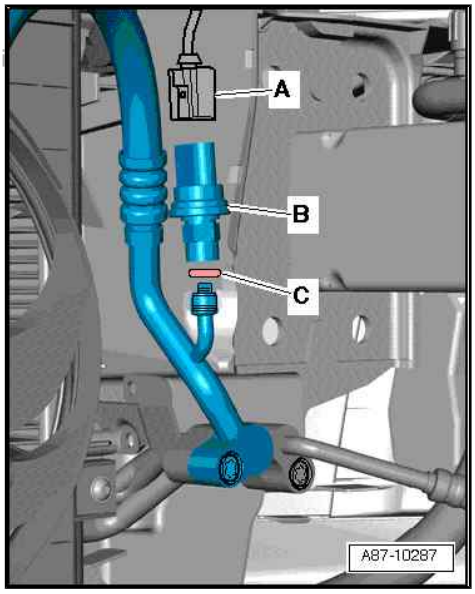
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– Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.



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– Unplug electrical connector -A- at high-pressure sender - G65- -item B-.

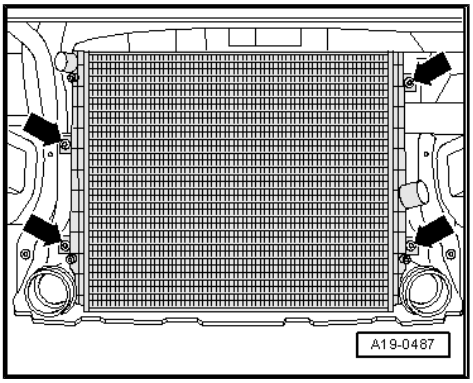


Note

Disregard -item C-.

– Place drip tray for workshop hoist - VAS 6208- beneath engine.

– Remove bolts -arrows- at rear and lift out radiator.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “4.1 Exploded view - radiator and radiator fans”, page 231

Note

♦ *If there are slight impressions on the fins, refer to ⇒ page 7 .*

♦ *Renew seals and O-rings.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

– Install radiator cowl ⇒ page 234 .

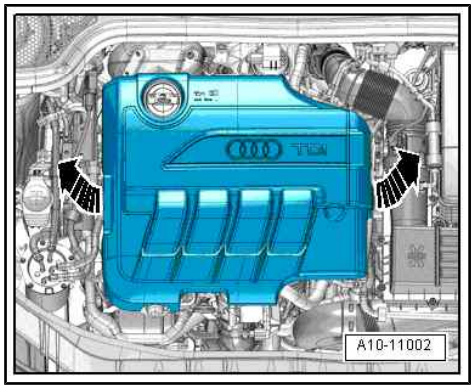
– Connect coolant hose with plug-in connector to radiator ⇒ page 232 .

– Fill cooling system ⇒ page 200 .

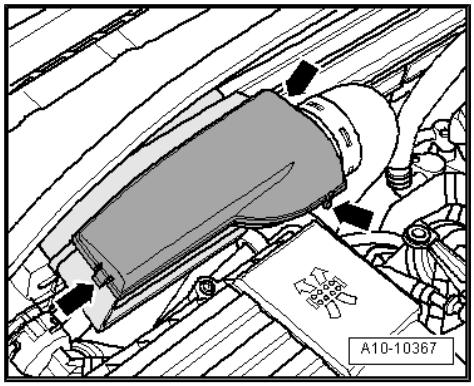
4.3 Removing and installing radiator cowl

Removing

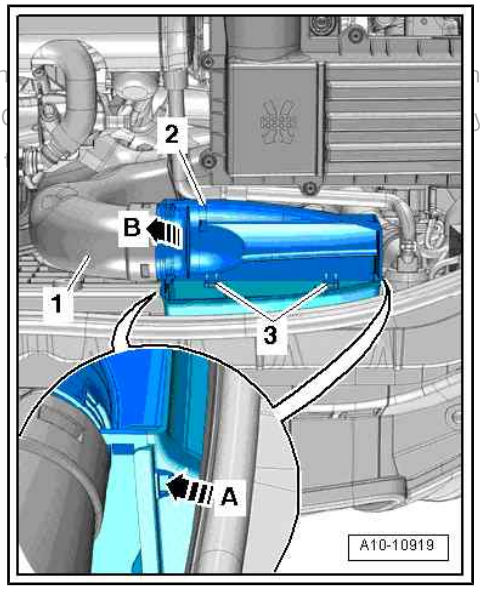
– Remove engine cover panel -arrows-.



– Pull cover off air duct (release clips on sides) -arrows-.



– Release clips on left and right -arrow A- and unclip air duct at bottom -2-.
– Swivel air duct (bottom) slightly to the rear and detach air duct (bottom) from retainers -3-.
– Detach air pipe -1- from air duct (bottom) -arrow B-.

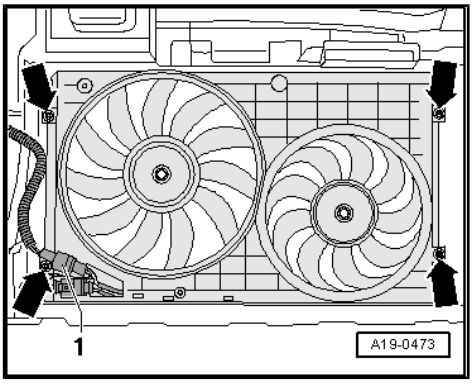


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WARNING

Risk of injury as the radiator fans may start up automatically.

- ***Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.***

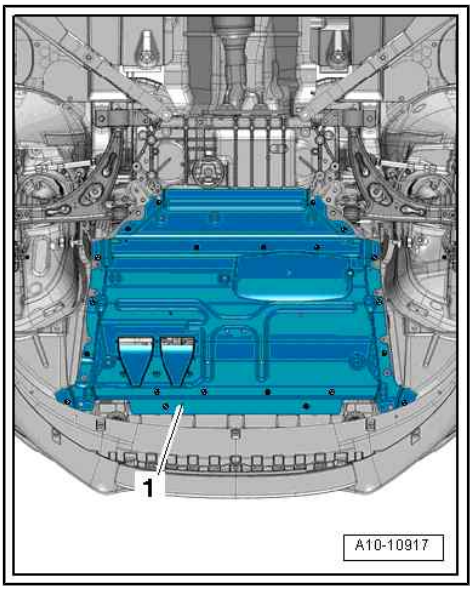


– Remove bolts -top arrows- for radiator cowl.

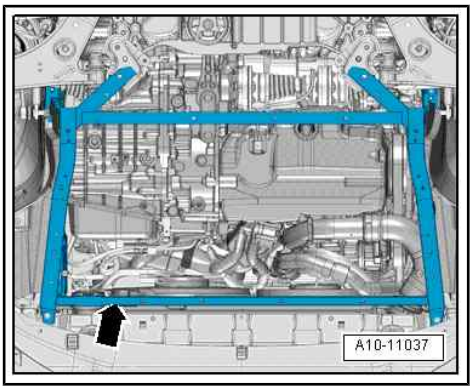
Note

- *The bolts -bottom arrows- are removed at a later stage.*
- *Disregard -item 1-.*

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

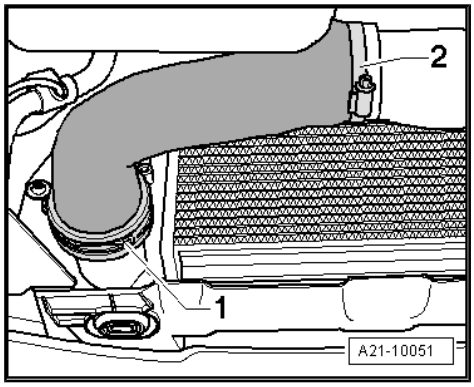


– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .

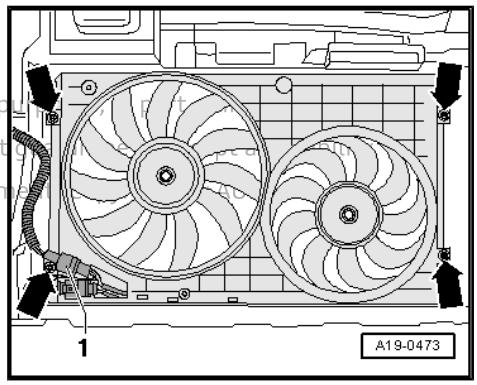


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– Release hose clip -2-, lift retaining clip -1- and remove air hose.



– Unplug electrical connector -1-.
– Remove bolts -bottom arrows- and take out air cowl downwards.



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Installing

Installation is carried out in reverse order; note the following:

Tightening torque

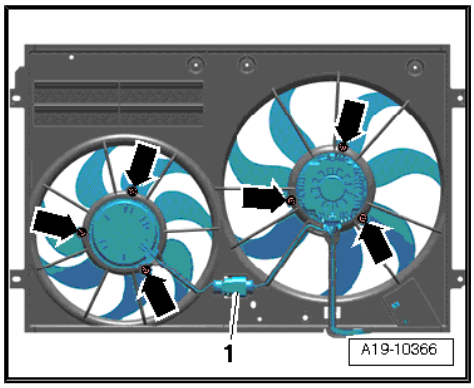
◆ ⇒ “4.1 Exploded view - radiator and radiator fans”, page 231

– Install air hose with plug-in connector ⇒ page 270 .
– Install noise insulation frame and noise insulation ⇒ Rep. gr. 50 .

4.4 Removing and installing radiator fans - V7- and -V177-

Removing

– Remove radiator cowl ⇒ page 234 .
– Unplug electrical connector -1- and move clear.
– Unscrew nuts -arrows- and remove radiator fans.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

◆ ⇒ “4.1 Exploded view - radiator and radiator fans”, page 231

Note

Fit all cable ties in the original positions when installing.

– Install radiator cowl ⇒ page 234 .

21 – Turbocharging/supercharging

1 Turbocharger - vehicles with engine codes CBAA, CBAB, CBBB

Overview

- ⇒ “1.1 Diagram of vacuum connections”, page 237
- ⇒ “1.2 Exploded view - turbocharger”, page 239
- ⇒ “1.3 Removing and installing turbocharger”, page 240
- ⇒ “1.4 Renewing vacuum unit with position sender for charge pressure positioner G581 ”, page 244

Note

Observe rules for cleanliness ⇒ page 5 .

1.1 Diagram of vacuum connections

Caution

When routing vacuum lines, make sure they are not kinked, twisted or crushed. Otherwise the engine can stop or fail to start.

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1 - Vacuum unit

- ❑ On turbocharger
- ❑ With position sender for charge pressure positioner - G581-

2 - Charge pressure control solenoid valve - N75-

3 - Noise insulation

4 - Air cleaner housing

5 - To brake servo

6 - Connection piece

- ❑ On vacuum pump

7 - Non-return valve

- ❑ Note installation position

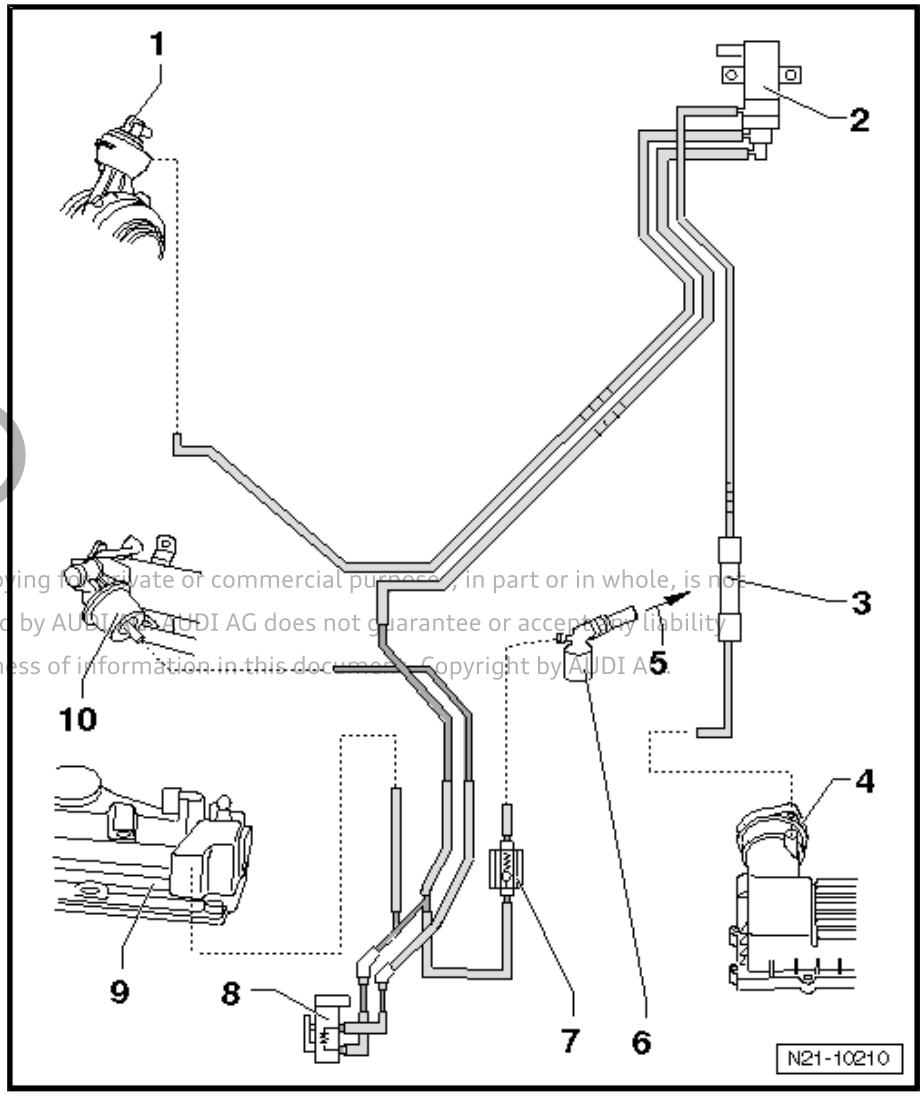
8 - Exhaust gas recirculation cooler change-over valve - N345-

- ❑ Checking change-over function ⇒ page 301

9 - Cylinder head cover

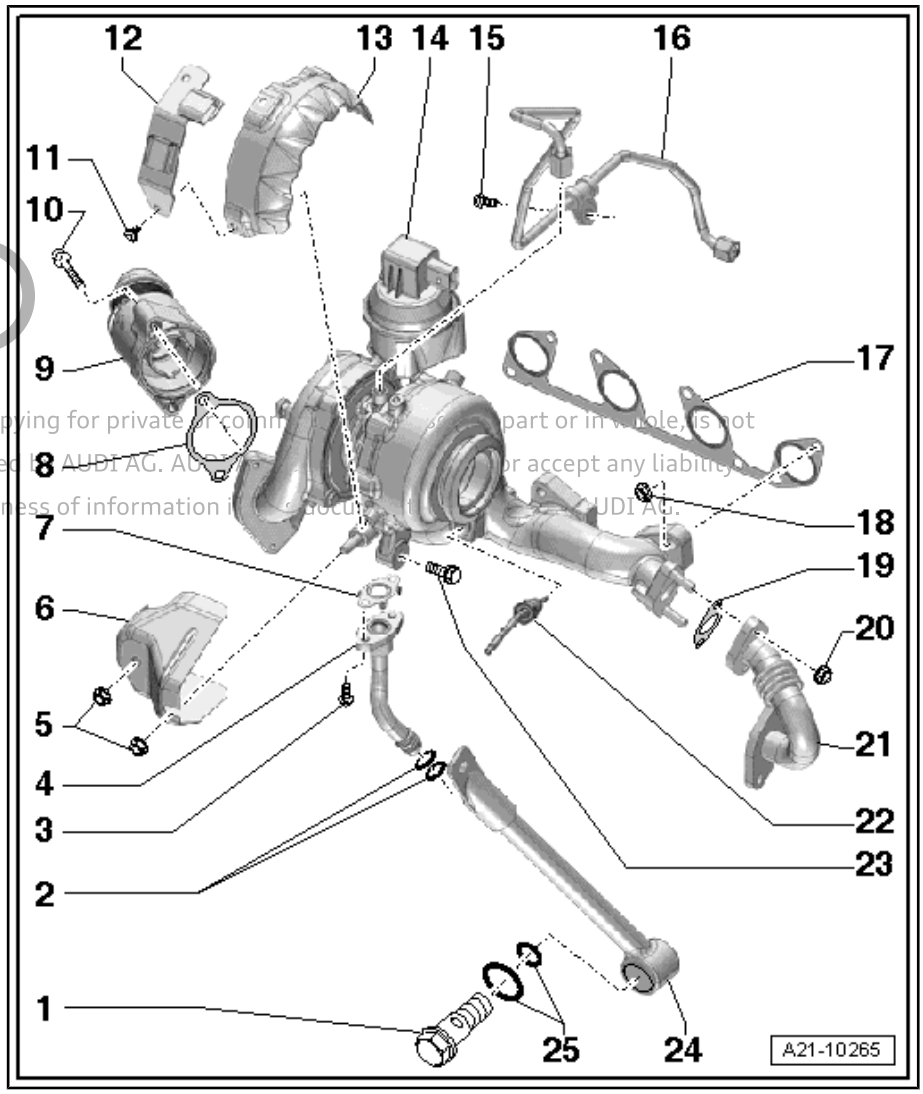
10 - Vacuum unit

- ❑ For change-over function for exhaust gas recirculation cooler



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1.2 Exploded view - turbocharger



1 - Banjo bolt
- ❑ Renew
- ❑ 60 Nm
- ❑ Tighten banjo bolt using a commercially available open-end spanner insert (27 mm) and a suitable torque wrench

2 - O-rings
- ❑ Renew

3 - Bolt
- ❑ Renew
- ❑ 15 Nm

4 - Oil return line

5 - Nuts
- ❑ 20 Nm

6 - Heat shield

7 - Gasket
- ❑ Renew

8 - Gasket
- ❑ Renew

9 - Pulsation damper

10 - Bolt
- ❑ 10 Nm

11 - Bolt
- ❑ 8 Nm

12 - Bracket
- ❑ For electrical wiring

13 - Heat shield

14 - Turbocharger
- ❑ Removing and installing turbocharger ⇒ page 240
- ❑ Renewing vacuum unit with position sender for charge pressure positioner - G581- ⇒ page 244

15 - Bolt
- ❑ 9 Nm

16 - Oil supply line
- ❑ Check for obstructions
- ❑ Before installing, fill turbocharger with engine oil at connection for oil supply line
- ❑ Tightening union nuts ⇒ Item 6 (page 178)

17 - Gasket
- ❑ Renew

18 - Nut
- ❑ 20 Nm
- ❑ If stud is renewed, too, tighten it to 15 Nm

19 - Gasket
- ❑ Renew

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20 - Nut

- ❑ Renew
- ❑ 20 Nm

21 - Pipe

- ❑ To exhaust gas recirculation cooler

22 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 292

23 - Bolt

- ❑ 20 Nm

24 - Support

- ❑ For turbocharger

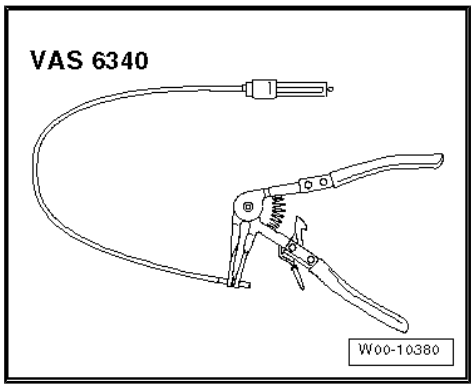
25 - O-rings

- ❑ Renew

1.3 Removing and installing turbocharger

Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6340-



Removing

– Observe rules for cleanliness ⇒ page 5 .

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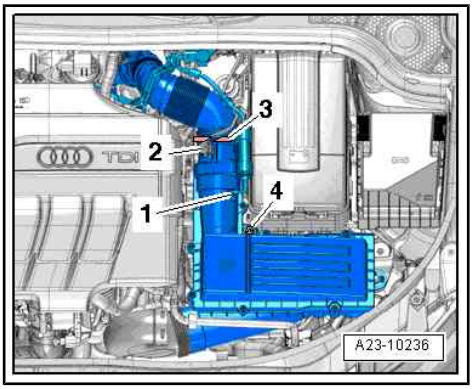
Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

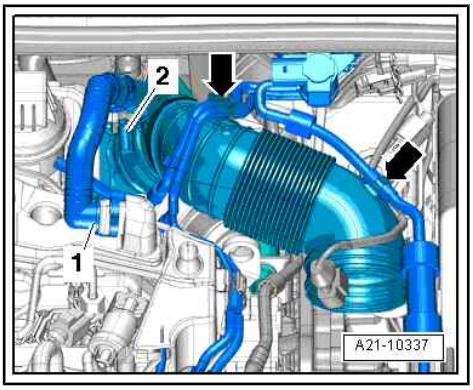
- ♦ *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- ♦ *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- ♦ *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

– Remove particulate filter ⇒ page 279 .

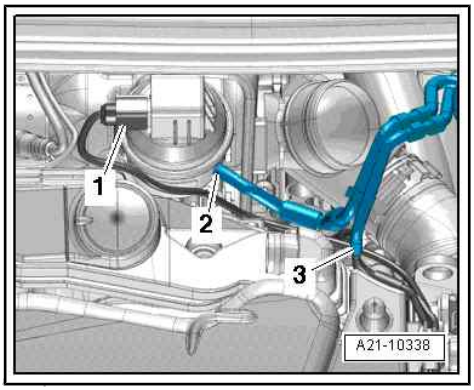
– Remove air cleaner housing ⇒ Rep. gr. 23 .



– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows- at air pipe.
– Loosen hose clip -2- and detach air pipe.



– Detach heat insulation sleeve.
– Unplug electrical connector -1- at position sender for charge pressure positioner - G581- .
– Detach vacuum hose -2- from vacuum unit of turbocharger.
– Disconnect vacuum hose -3-.

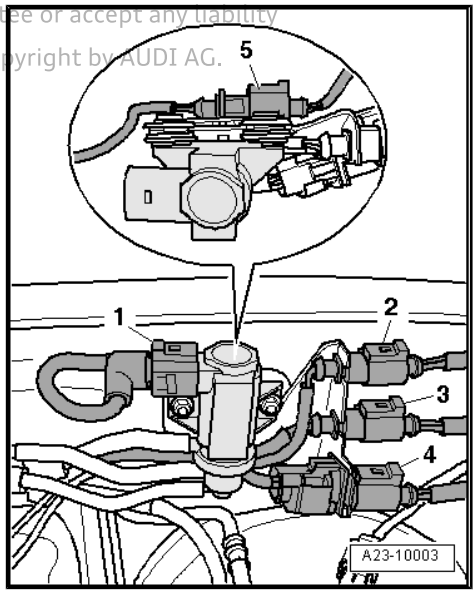


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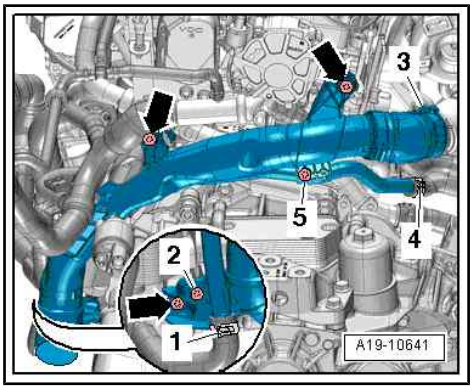
– Unplug electrical connector -3- for exhaust gas temperature sender 1 - G235- and move electrical wiring clear.

Note

Disregard -items 1, 2, 4, 5-.



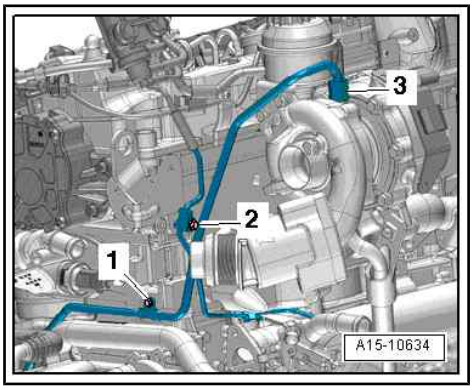
– Remove bolts -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Release hose clip -3- and push air pipe (left-side) from turbocharger towards the left.



Note

Disregard -items 1, 2, 4, 5-.

– Unscrew oil supply line from connection on turbocharger. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut -3-.

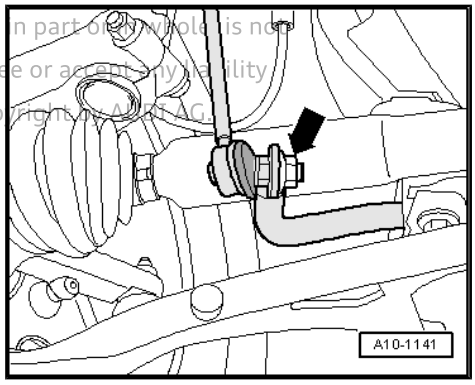


Note

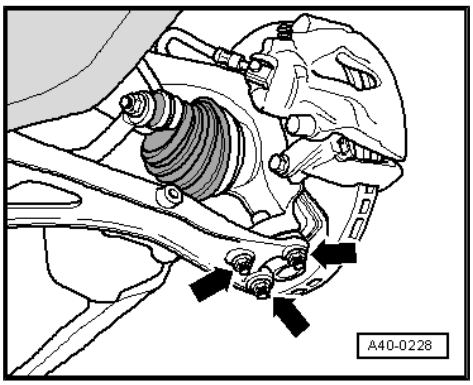
Disregard items -1 and 2-.

– Remove nuts -arrow- for coupling rod on anti-roll bar on both sides.

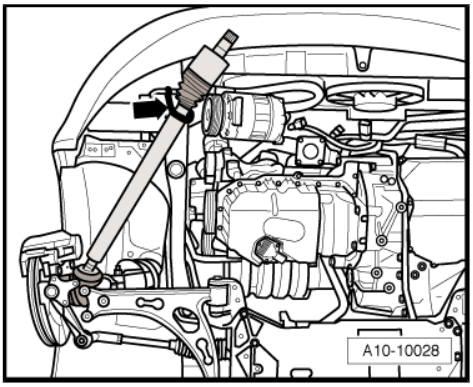
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– Unscrew nuts -arrows- for swivel joint (right-side).
– Detach swivel joint from wishbone (right-side).



– Pivot drive shaft (right-side) towards the front.
– Tie up drive shaft to longitudinal member -arrow-.

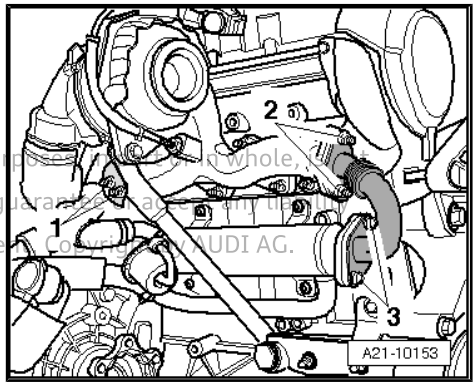


Note

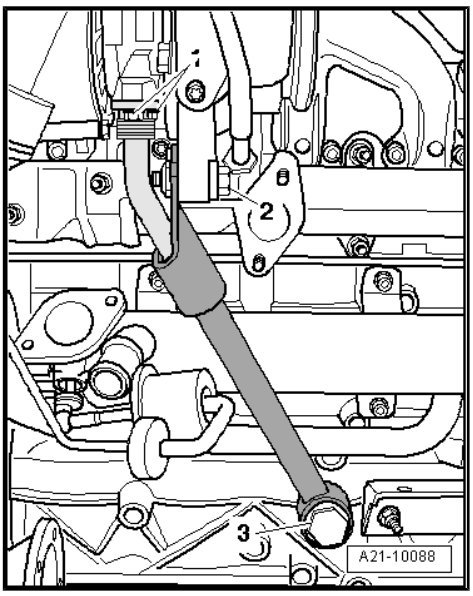
Take care not to damage the surface coating of the drive shaft.

– Unscrew nuts -1- and detach heat shield (left-side) from exhaust manifold.
– Remove nuts -2- and bolts -3-, and detach exhaust gas recirculation pipe.

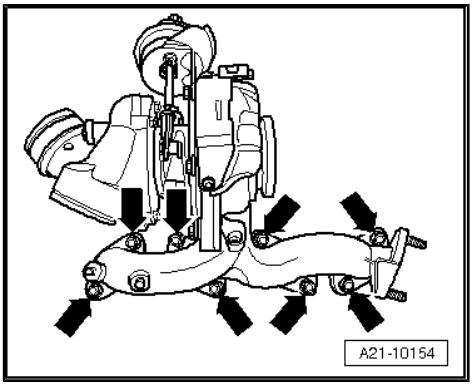
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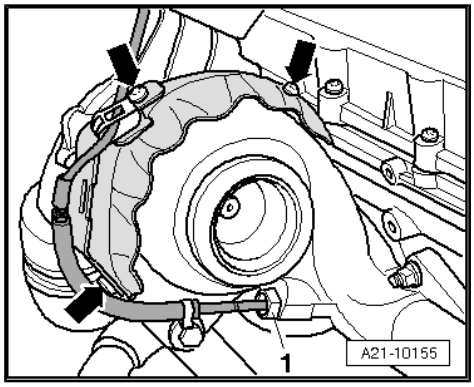
– Remove bolts -1, 2- and banjo bolt -3-.
– Detach support for turbocharger with oil return pipe.



– Remove bolts -arrows- and detach turbocharger with exhaust manifold from cylinder head.



– Move clear electrical wiring for exhaust gas temperature sender 1 - G235- -item 1-.
– Remove bolts -arrows- and detach heat shield.
– Take out turbocharger with exhaust manifold from below, at the same time pushing engine/gearbox assembly slightly forwards.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “1.2 Exploded view - turbocharger”, page 239

Note

♦ *Renew seals, gaskets, O-rings and self-locking nuts.*
♦ *Fill turbocharger with engine oil at connection for oil supply line.*
♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
♦ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*
♦ *After installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*
♦ *Fit heat insulation sleeves in the original positions when installing.*

– Install exhaust system and align free of stress ⇒ page 288 .
– Install wishbone and coupling rod ⇒ Rep. gr. 40 .
– Install air pipe (left-side) ⇒ page 268 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install particulate filter ⇒ page 279 .
– Check oil level ⇒ Maintenance ; Booklet 808 .

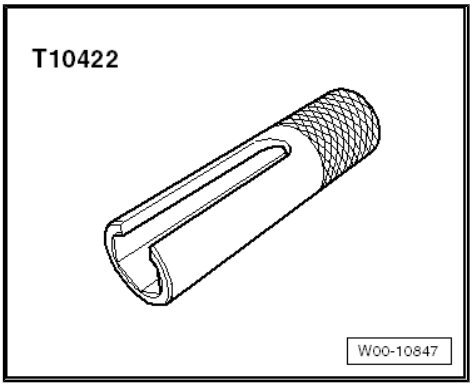
1.4 Renewing vacuum unit with position sender for charge pressure positioner - G581-

Special tools and workshop equipment required

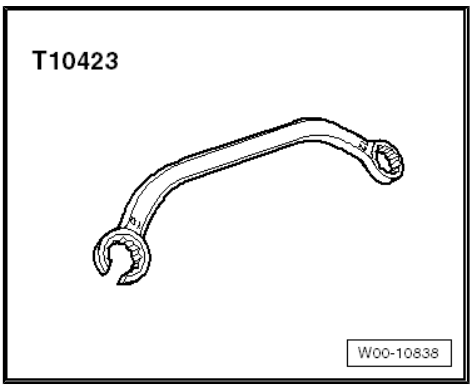
♦ Vehicle diagnostic tester

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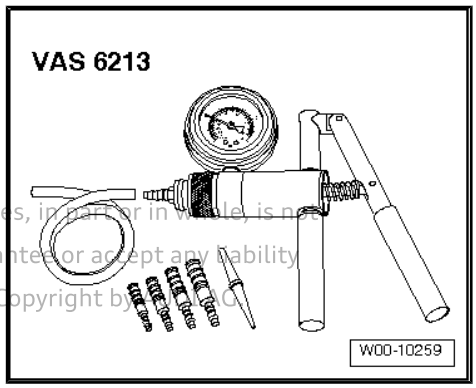
- Socket, AF 10 mm - T10422- / socket, AF 10 mm - T10422A-



- Ring spanner - T10423-

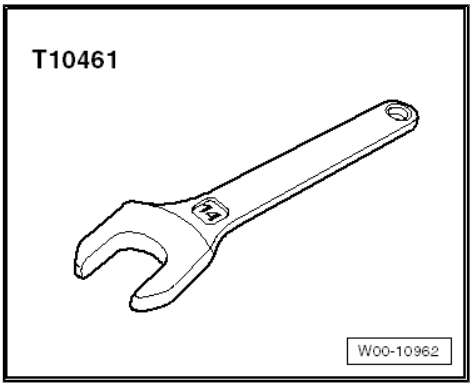


- Hand vacuum pump - VAS 6213-



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- Open-end spanner 14 mm - T10461-



Note

- *Socket, AF 10 mm - T10422A- replaces socket, AF 10 mm - T10422- . If your workshop still has T10422 sockets, these can continue to be used.*
- *Replacement part kit is available for renewing vacuum unit with position sender for charge pressure positioner - G581- ⇒ Electronic parts catalogue .*
- *On vehicles with dual clutch gearbox, the basic setting function can only be performed on the vacuum unit if the selector lever is in position "P".*

Removing

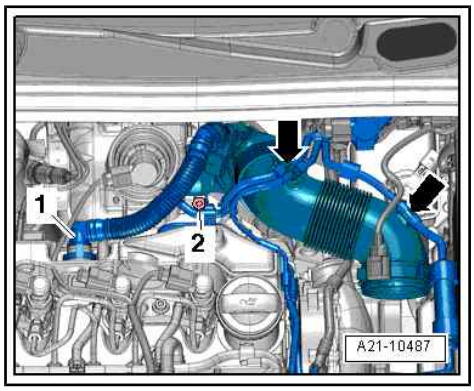
– Remove air cleaner housing with air mass meter and connecting pipe ⇒ Rep. gr. 23 .

– Press release tabs and disconnect crankcase breather connecting pipe -1- from cylinder head cover.

– Move vacuum hoses clear -arrows-.

– Unscrew captive bolt -2-, swivel air pipe with connection to rear and detach from turbocharger.

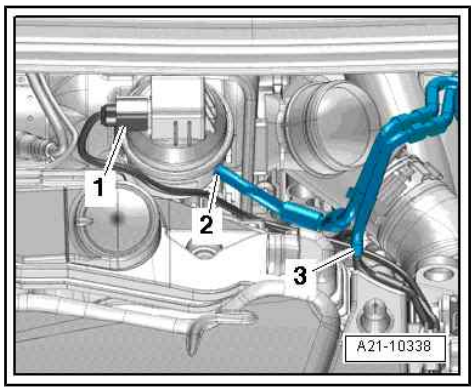
– Seal opening on turbocharger with sealing cap from replacement part kit.



– Detach heat shield sleeve around electrical connector -1-.

– Unplug electrical connector -1- at position sender for charge pressure positioner - G581- .

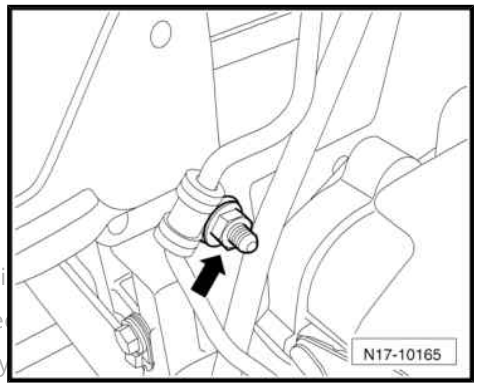
– Detach vacuum hose -2- from vacuum unit of turbocharger.



– Depending on version, remove nut -arrow- securing oil supply line/vacuum line to cylinder head.

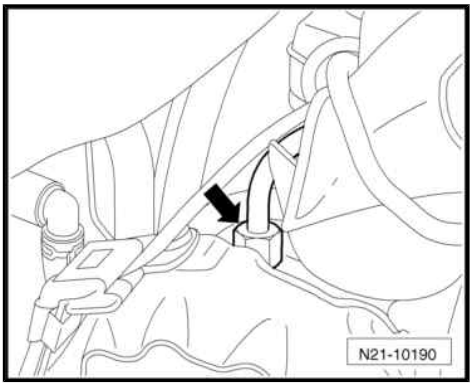
Caution

It is important that you counterhold connection when loosening oil supply line. Risk of further damage occurring later.



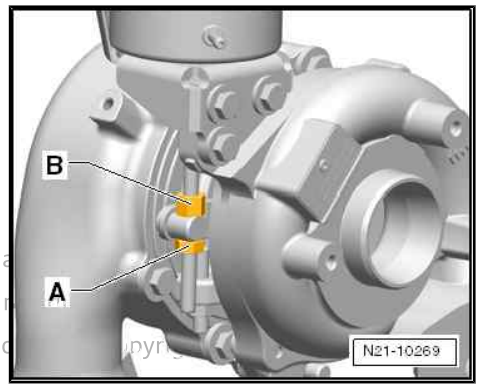
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– Counterhold connection using open end spanner - T10461- and unscrew oil supply line -arrow- from turbocharger.
– Seal opening for oil supply line in turbocharger with plug from replacement part kit.

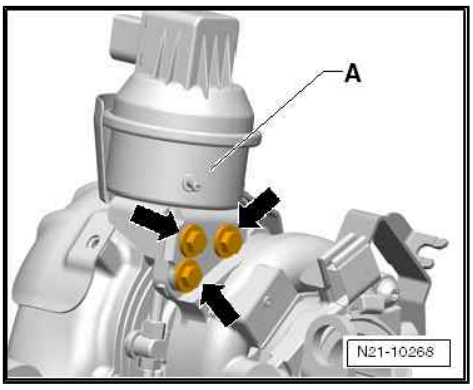


– Counterhold lock nut -B- with ring spanner - T10423- and remove securing nut -A- from control rod using socket - T10422- .

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– Unscrew bolts -arrows- securing vacuum unit and detach vacuum unit -A-.



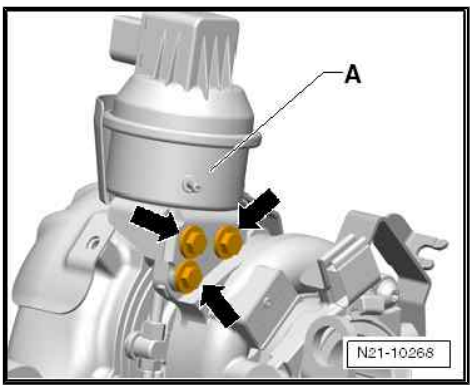
Installing

Caution

Only use new bolts and nuts from replacement part kit.

– If necessary, remove bottom nut securing control rod from new vacuum unit.
– Screw lock nut on control rod by hand as far as stop towards vacuum unit.
– Guide control rod through adjusting lever on turbocharger, fit vacuum unit -A- and secure bolts.

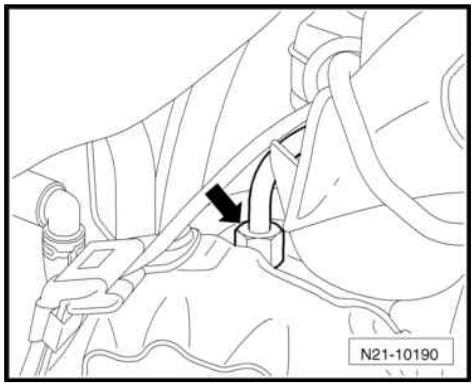
– Tighten securing bolts -arrows- to 8 Nm.



Note

Please ensure that guide can be moved easily on control rod.

– Remove protective cap, fit oil supply line -arrow- on turbocharger and tighten to 22 Nm.



– Plug in connector -2- at position sender for charge pressure positioner - G581- and fasten heat shield sleeve.

– Connect vehicle diagnostic tester .

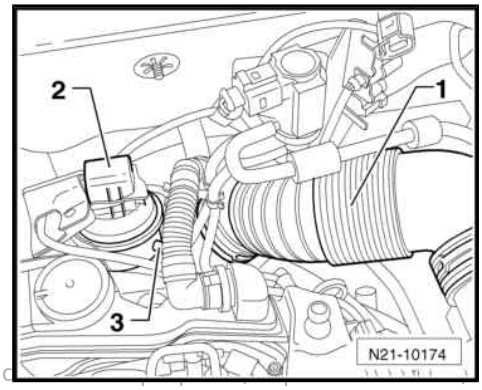
Selecting operating mode:

– On touch screen, press button for “Vehicle self-diagnosis”.

Selecting vehicle system:

– On touch screen, press button for “01 - Engine electronics”.

The display will show the identification and coding of the engine control unit.



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Selecting diagnostic function:

– On touch screen, press button for “011 - Measured values”.

– On the numeric keypad, enter measured value block “120” and confirm your entry with “Q” key.

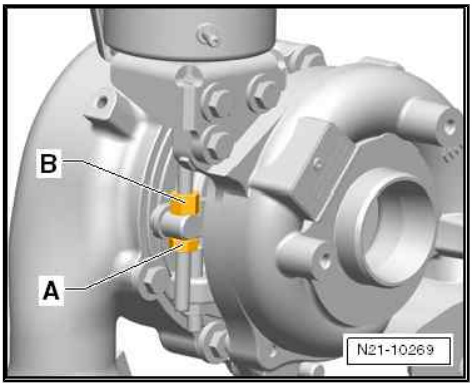
– Connect hand vacuum pump - VAS 6213- to vacuum unit.

– Create voltage of 0.760 V by generating a vacuum (observe minimum value of measured value block).

Caution

During the following adjustment procedure for the control rod, the vacuum and the voltage of 0.760 V must be maintained.

– Slowly screw lock nut -B- for control rod downwards by hand. Adjusting lever is on bottom stop.
– Counterhold lock nut -B- and screw securing nut -A- on control rod against adjusting lever. Tighten slightly using ring spanner - T10423- .
– Release vacuum pressure from vacuum unit.
– Observe minimum value of measured value block: value of 3.30 ... 3.90 V should be displayed (unpressurised).
– Apply socket - T10422- , counterhold lock nut -B- using ring spanner - T10423- and tighten securing nut -A-.



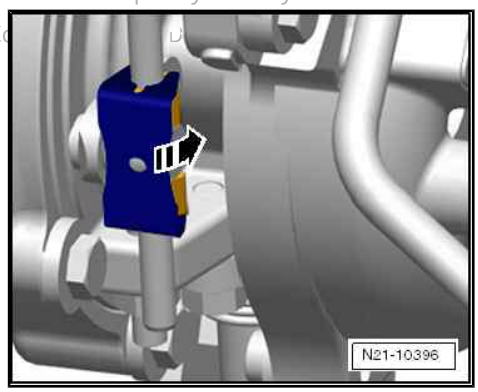
Caution

Create vacuum of 0.75 ± 0.05 bar for vacuum unit to ensure that adjusting lever is positioned at stop. A voltage of 0.760 V should build up.

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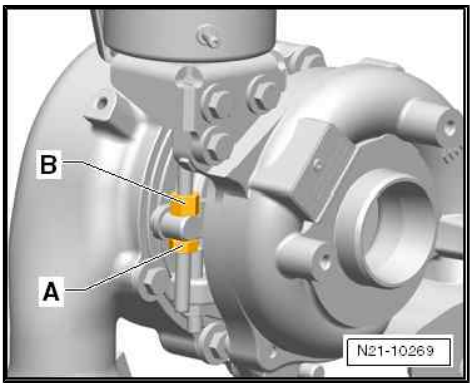
Voltage value OK

– Press locking plate onto control rod by hand and turn by 90° in direction of -arrow-.
– Seal connection between control rod and securing nut with sealing paint from replacement part kit.

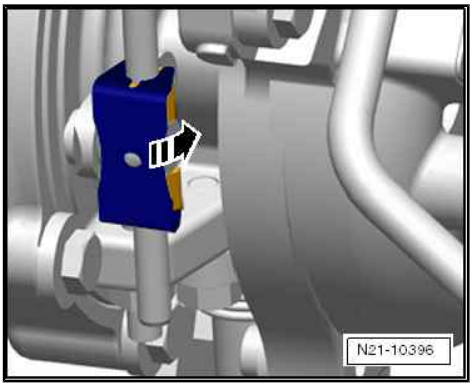


Voltage value not OK

– Counterhold lock nut -B-, loosen securing nut -A- on control rod and adjust value by turning lock nut -B-.
– Counterhold lock nut -B-, screw securing nut -A- in other direction and tighten connection using socket - T10422- .

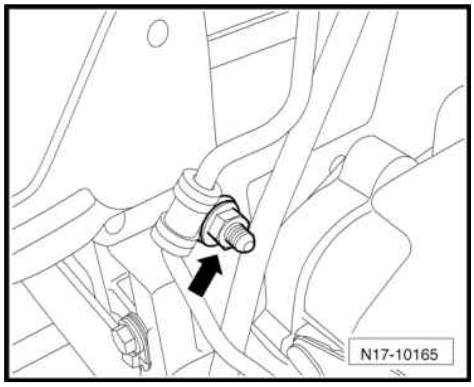


– Press locking plate onto control rod by hand and turn by 90° in direction of -arrow-.
– Seal connection between control rod and securing nut with sealing paint from replacement part kit.



Continued

– Depending on version, fit nut -arrow- securing oil supply line/ vacuum line to cylinder head and tighten connection.
– Remove sealing cap from turbocharger.
– Fully assemble engine components.
– Start engine and erase event memory ⇒ Vehicle diagnostic tester.
– Check adjustment as follows:



Selecting diagnostic function:

– On touch screen, press button for “006 - Basic setting”.
– On the numeric keypad, enter measured value block “120” and confirm your entry with “Q” key.
– On bottom half of touch screen, press button for “Activate”.
– Observe value on bottom part of display: value should fluctuate between 0.65 ... 0.85 V and 3.30 ... 3.90 V (vacuum unit is moved to both limit stops alternately).

Voltage values OK:

– Exit basic setting.

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2 Turbocharger - vehicles with engine code CBEA

Overview

- ⇒ “2.1 Diagram of vacuum connections”, page 251
- ⇒ “2.2 Exploded view - turbocharger”, page 253
- ⇒ “2.3 Removing and installing turbocharger”, page 255
- ⇒ “2.4 Renewing vacuum unit with position sender for charge pressure positioner G581”, page 261

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Note

Observe rules for cleanliness ⇒ page 5 .

2.1 Diagram of vacuum connections

Caution

When routing vacuum lines, make sure they are not kinked, twisted or crushed. Otherwise the engine can stop or fail to start.

1 - Vacuum unit

- ❑ On turbocharger
- ❑ With position sender for charge pressure positioner - G581-

2 - Charge pressure control solenoid valve - N75-

3 - From brake servo

4 - To vacuum pump

5 - Connection piece

- ❑ On vacuum pump

6 - Non-return valve

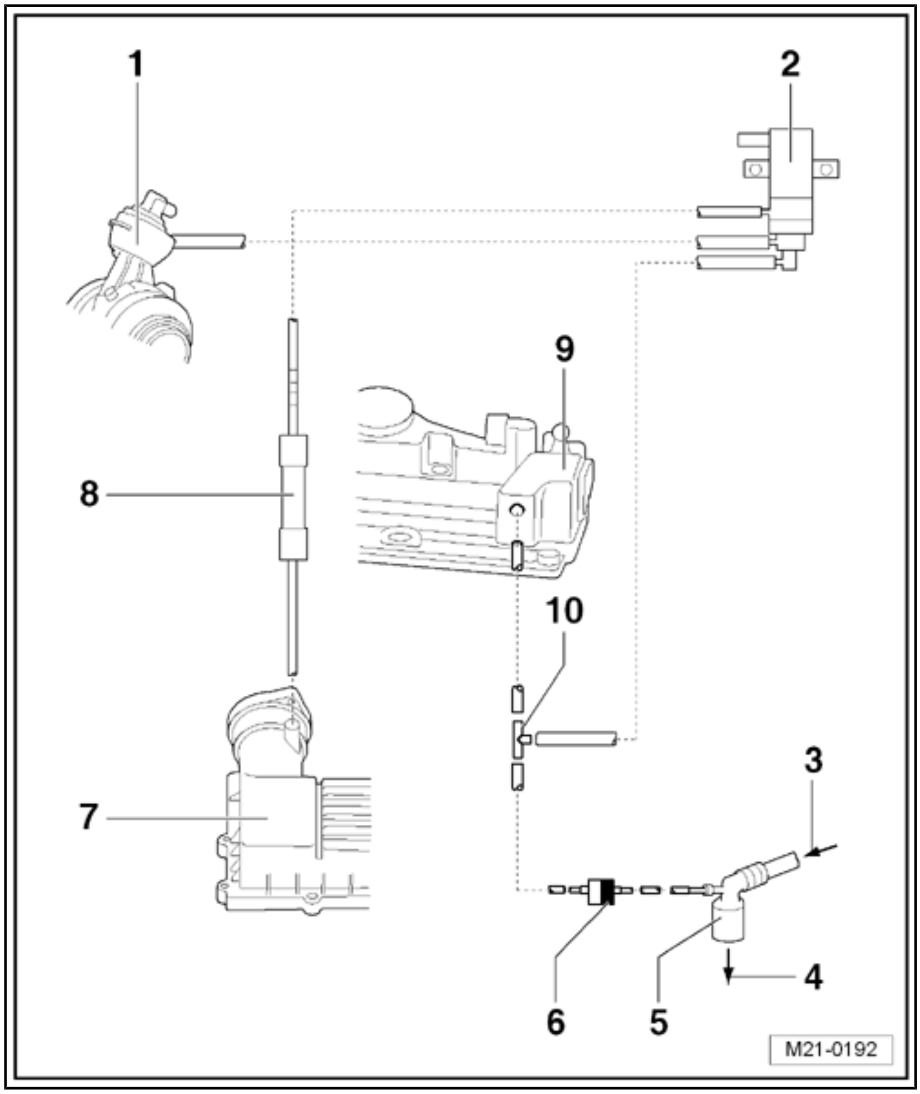
- ❑ Note installation position

7 - Air cleaner housing

8 - Noise insulation

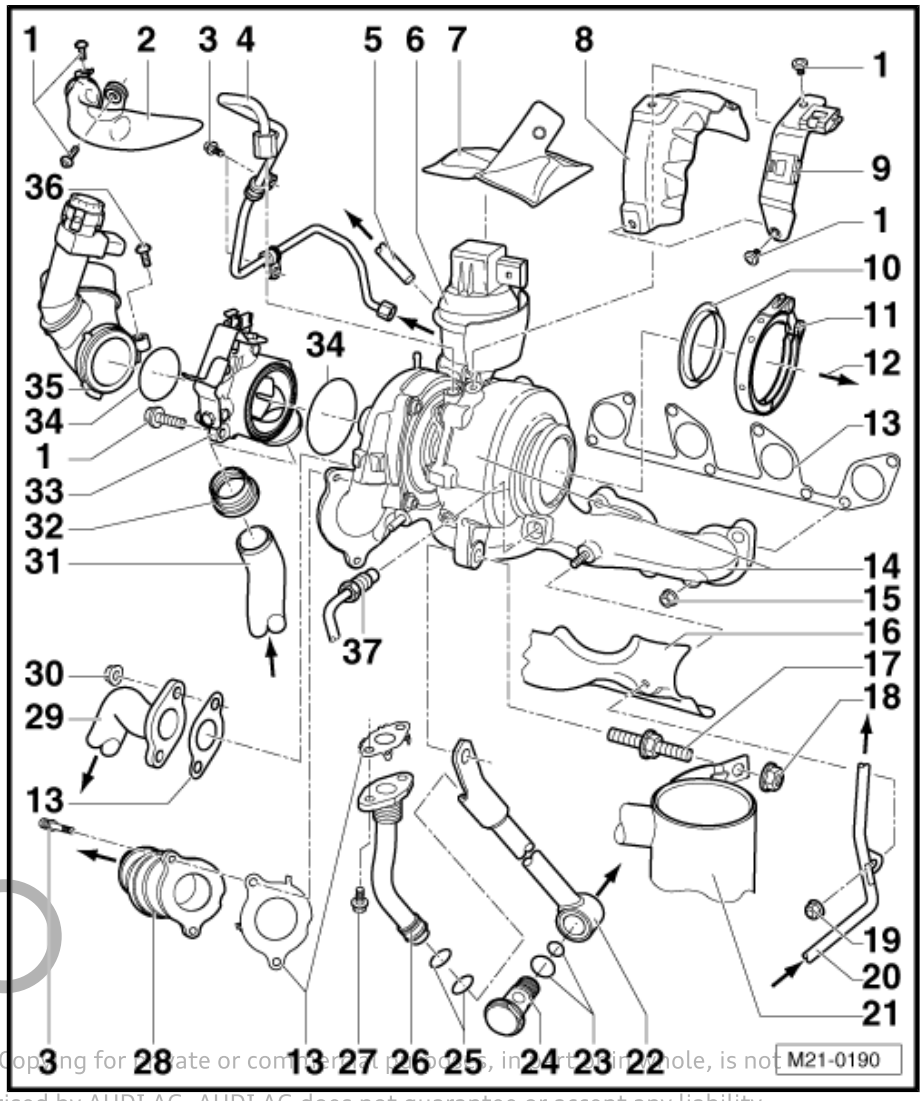
9 - Cylinder head cover

10 - Branched connection



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2.2 Exploded view - turbocharger



1 - Bolt
- ❑ 8 Nm

2 - Warm air collector plate

3 - Bolt
- ❑ 10 Nm

4 - Oil supply line
- ❑ 22 Nm
- ❑ Do not attempt to bend oil supply lines to a different shape
- ❑ Install free of stress
- ❑ Check that the oil supply line is not obstructed before installing
- ❑ Before fitting oil supply line, fill turbocharger with engine oil at connection

5 - Vacuum hose
- ❑ Ensure secure fitting and route avoiding kinks
- ❑ To charge pressure control solenoid valve - N75-
- ❑ Diagram of vacuum hose connections ⇒ page 251

6 - Vacuum unit with position sender for charge pressure positioner - G581-
- ❑ Renewing vacuum unit with position sender for charge pressure positioner - G581- ⇒ page 261

7 - Heat shield
- ❑ Renew if damaged

8 - Heat shield

9 - Bracket
- ❑ For wiring harness

10 - Seal
- ❑ Renew

11 - Clip
- ❑ 7 Nm
- ❑ Renew

12 - To particulate filter

13 - Gasket
- ❑ Renew
- ❑ Note installation position

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14 - Turbocharger

- ❑ Removing and installing turbocharger ⇒ page 255
- ❑ Renewing vacuum unit with position sender for charge pressure positioner - G581- ⇒ page 261

15 - Nut

- ❑ 23 Nm
- ❑ Renew
- ❑ Lubricate exhaust manifold studs with high-temperature paste
- ❑ If studs are renewed, too, tighten them to 15 Nm

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16 - Heat shield

17 - Hexagon stud

- ❑ 20 Nm

18 - Nut

- ❑ 23 Nm

19 - Nut

- ❑ 23 Nm

20 - Control pipe

- ❑ 23 Nm
- ❑ Do not attempt to bend control pipe to a different shape
- ❑ Install free of stress

21 - Filter

- ❑ For exhaust gas recirculation
- ❑ Removing and installing ⇒ page 345

22 - Support

- ❑ For turbocharger

23 - Seal

- ❑ Renew

24 - Banjo bolt

- ❑ 60 Nm
- ❑ Renew
- ❑ Tighten banjo bolt using a commercially available open-end spanner insert (27 mm) and a suitable torque wrench

25 - O-ring

- ❑ Renew

26 - Oil return pipe

- ❑ Install free of stress

27 - Bolt

- ❑ 15 Nm

28 - Pulsation damper

29 - Connecting pipe

Caution

Make sure that flexible joint on connecting pipe is not stretched by bending. There is the risk of cracking.

- ❑ Install free of stress

30 - Nut

- ❑ 20 Nm
- ❑ Lubricate exhaust manifold studs with high-temperature paste

31 - Connecting pipe

32 - Seal

- ❑ Renew if damaged

33 - Connection

34 - O-ring

- ❑ Renew if damaged

35 - Intake elbow

- ❑ Check that it is securely seated
- ❑ Clean if dirty
- ❑ With heater element for crankcase breather - N79-

36 - Bolt

- ❑ 8 Nm

37 - Exhaust gas temperature sender 1 - G235-

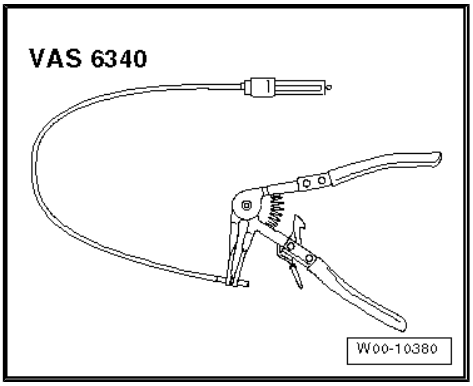
- ❑ Lubricate threads only with high-temperature paste

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2.3 Removing and installing turbocharger

Special tools and workshop equipment required

- ♦ Hose clip pliers - VAS 6340-



- ♦ Crow foot wrench (commercially available)

Removing

– Observe rules for cleanliness ⇒ page 5 .

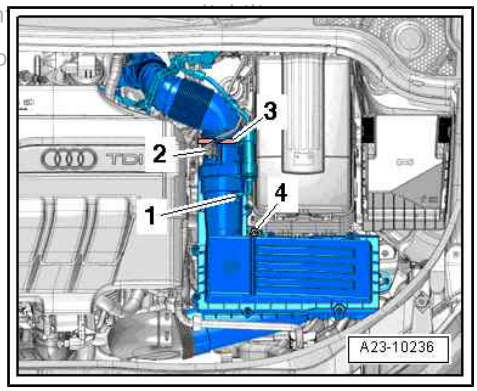
Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

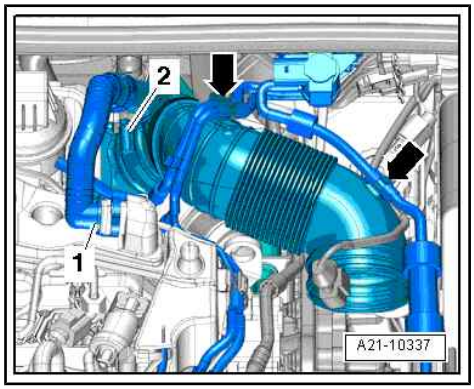
- ***Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.***
- ***Check the entire charge air system (including the charge air cooler) for foreign matter.***
- ***If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.***

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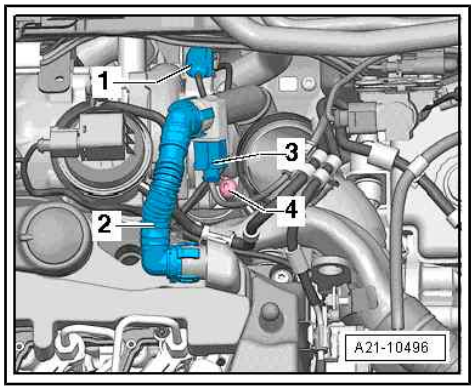
– Remove particulate filter ⇒ page 324 .
– Remove air cleaner housing ⇒ Rep. gr. 23 .



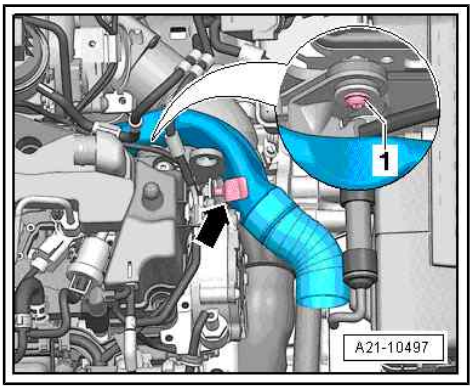
– Move clear vacuum hoses -arrows- at air pipe.
– Loosen hose clip -2- and detach air pipe.



– Press release tabs and disconnect crankcase breather hose -2- from cylinder head cover.
– Move clear electrical connector -1- on exhaust gas temperature sensor - G98- .
– Unplug electrical connector -3-.
– Remove bolt -4-, turn intake elbow in clockwise direction and detach from connection.

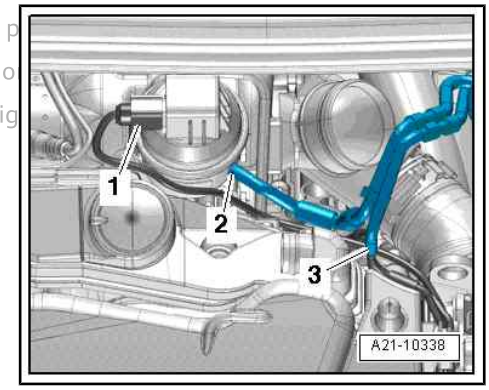


– Remove bolt -1- and detach warm air collector plate -arrow-.



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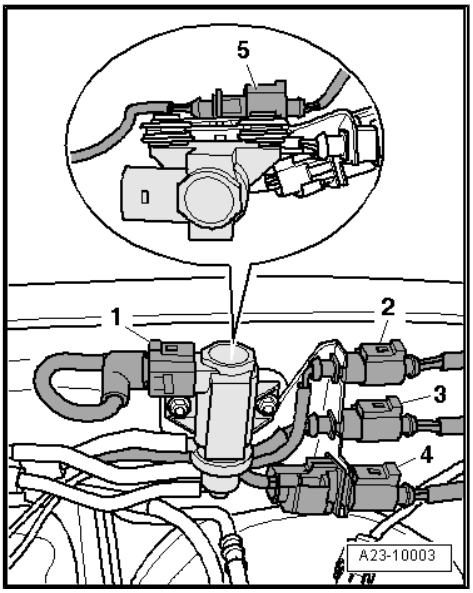
– Detach heat insulation sleeve.
– Detach vacuum hose -2- from vacuum unit of turbocharger.
– Unplug electrical connector -1- at position sender for charge pressure positioner - G581- .



– Unplug electrical connector -3- for exhaust gas temperature sender 1 - G235- and move electrical wiring clear.

Note

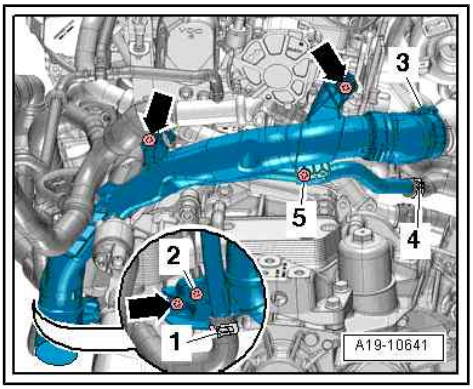
Disregard -items 1, 2, 4, 5-.



– Remove bolts -arrows-.
– Using removal lever - 80 - 200- , move clear electrical wiring and hoses at air pipe (left-side).
– Release hose clip -3- and push air pipe (left-side) from turbocharger towards the left.

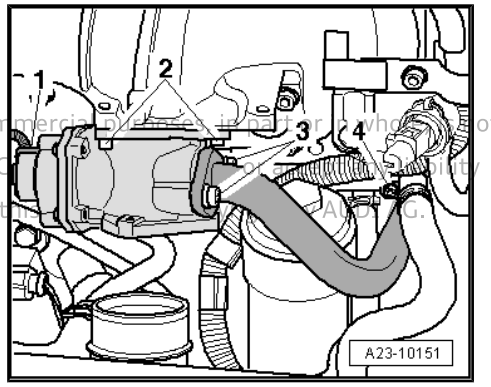
Note

Disregard -items 1, 2, 4, 5-.

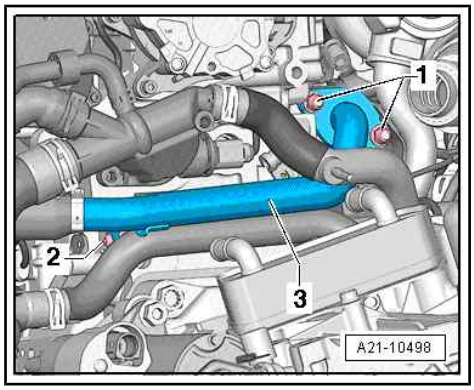


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– Remove bolts -3- at exhaust gas recirculation valve - N18- .



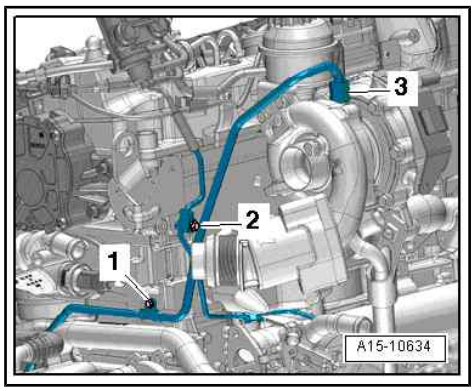
– Remove nuts -1-.
– Remove bolt -2- and guide out exhaust gas recirculation pipe -3-.



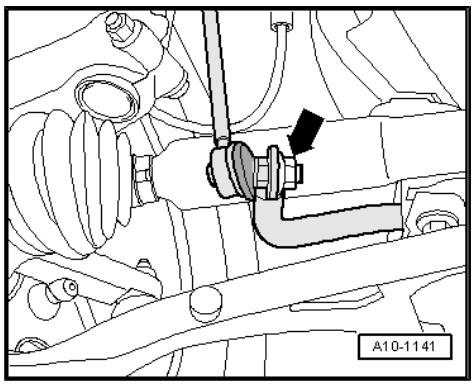
– Unscrew oil supply line from connection on turbocharger. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut -3-.

Note

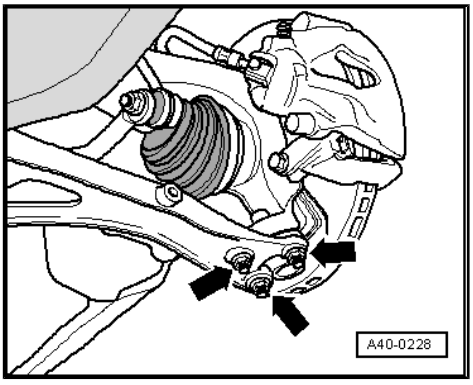
Disregard items -1 and 2-.



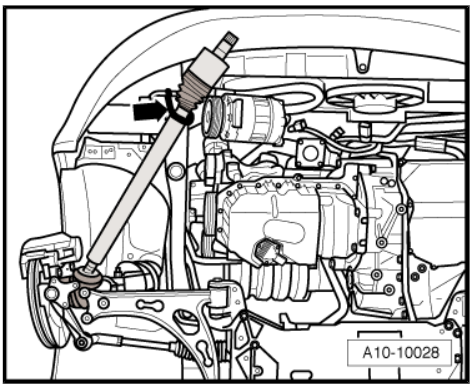
– Remove nuts -arrow- for coupling rod on anti-roll bar on both sides.



– Unscrew nuts -arrows- for swivel joint (right-side).
– Detach swivel joint from wishbone (right-side).



– Pivot drive shaft (right-side) towards the front.
– Tie up drive shaft to longitudinal member -arrow-.

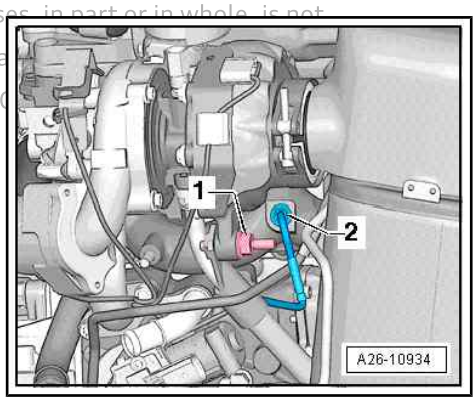


Note

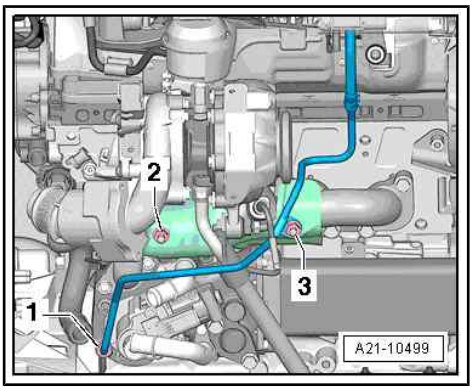
Take care not to damage the surface coating of the drive shaft.

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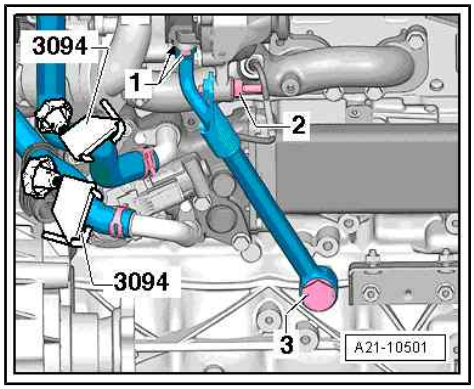
– Remove bolt -1-.
– Mark installation position of exhaust gas temperature sender 1 - G235- -item 2- and move clear electrical wiring for exhaust gas temperature sender 1 .
– Unscrew exhaust gas temperature sender 1 - G235- -item 2- from exhaust manifold using a crow foot wrench.



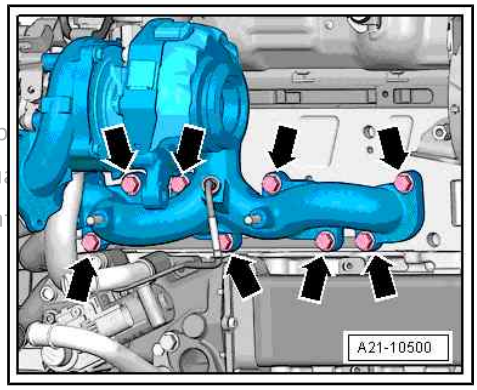
– Remove nut -3- and union nut -1- and take out control pipe.
– Unscrew nut -2- and remove heat shield.



– Remove bolts -1-.
– Remove banjo bolt -3- and detach support for turbocharger with oil return pipe.



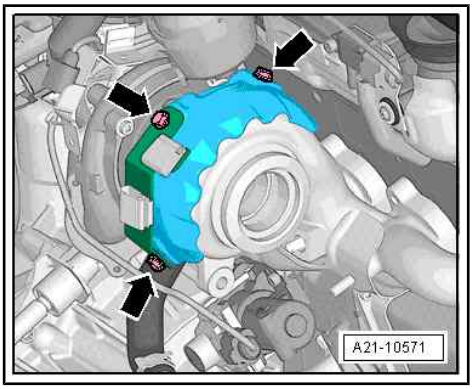
– Remove bolts -arrows- and detach turbocharger with exhaust manifold from cylinder head.



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– Remove bolts -arrows- and detach bracket and heat shield.

– Take out turbocharger with exhaust manifold from below, at the same time pushing engine/gearbox assembly slightly forwards.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “2.2 Exploded view - turbocharger”, page 253

Note

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♦ *Renew seals, gaskets, O-rings and self-locking nuts.*

♦ *Fill turbocharger with engine oil at connection for oil supply line.*

♦ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*

♦ *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

♦ *After installing the turbocharger, allow the engine to idle for approx. 1 minute without pressing the accelerator to ensure that the turbocharger is supplied with oil.*

♦ *Fit heat insulation sleeves in the original positions when installing.*

– Install exhaust system and align free of stress ⇒ page 332 .

– Install wishbone and coupling rod ⇒ Rep. gr. 40 .

– Install air pipe (left-side) ⇒ page 268 .

– Install air cleaner housing ⇒ Rep. gr. 23 .

– Install particulate filter ⇒ page 324 .

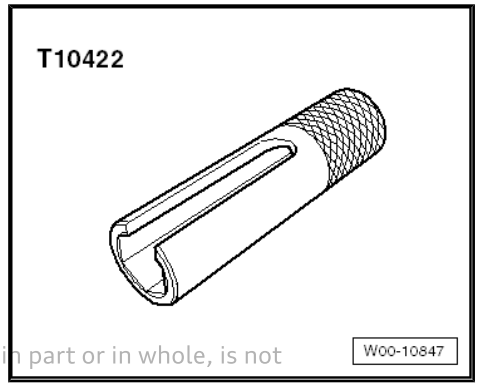
– Check oil level ⇒ Maintenance ; Booklet 808 .

2.4 Renewing vacuum unit with position sender for charge pressure positioner - G581-

Special tools and workshop equipment required

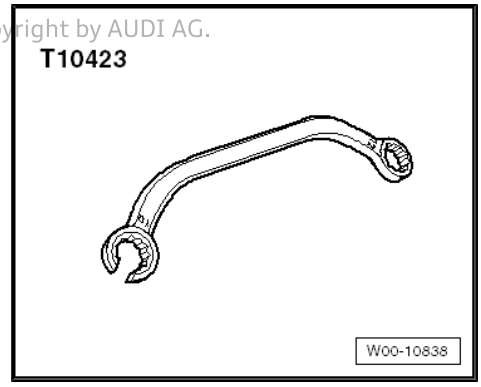
♦ Vehicle diagnostic tester

- Socket, AF 10 mm - T10422- / socket, AF 10 mm - T10422A-

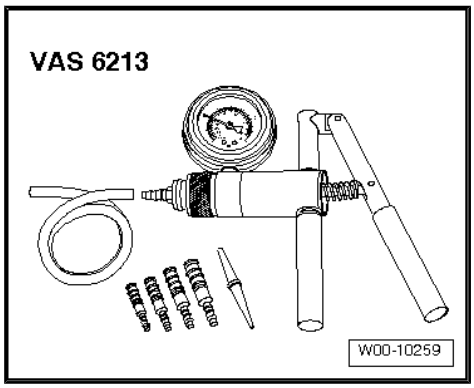


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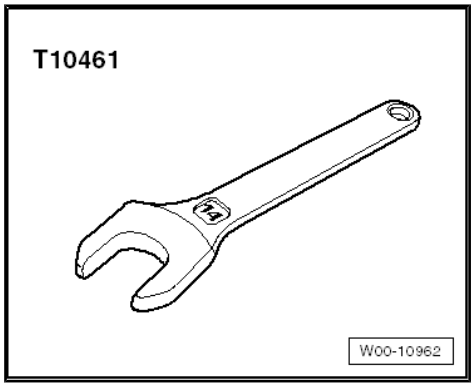
- Ring spanner - T10423-



- Hand vacuum pump - VAS 6213-



- Open-end spanner 14 mm - T10461-



Note

- *Socket, AF 10 mm - T10422A- replaces socket, AF 10 mm - T10422- . If your workshop still has T10422 sockets, these can continue to be used.*
- *Replacement part kit is available for renewing vacuum unit with position sender for charge pressure positioner - G581- ⇒ Electronic parts catalogue .*
- *On vehicles with dual clutch gearbox, the basic setting function can only be performed on the vacuum unit if the selector lever is in position "P".*

Removing

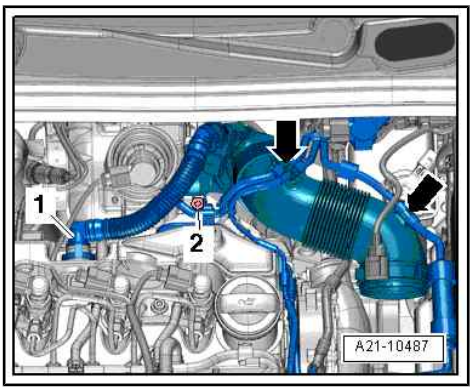
– Remove air cleaner housing with air mass meter and connecting pipe ⇒ Rep. gr. 23 .

– Press release tabs and disconnect crankcase breather connecting pipe -1- from cylinder head cover.

– Move vacuum hoses clear -arrows-.

– Unscrew captive bolt -2-, swivel air pipe with connection to rear and detach from turbocharger.

– Seal opening on turbocharger with sealing cap from replacement part kit.

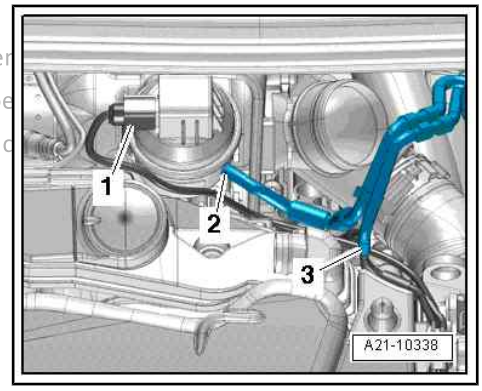


– Detach heat shield sleeve around electrical connector -1-.

– Unplug electrical connector -1- at position sender for charge pressure positioner - G581- .

– Detach vacuum hose -2- from vacuum unit of turbocharger.

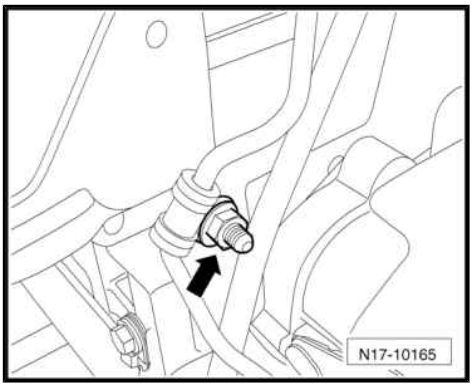
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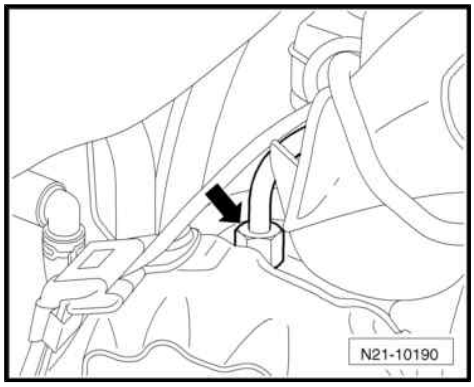
– Depending on version, remove nut -arrow- securing oil supply line/vacuum line to cylinder head.

Caution

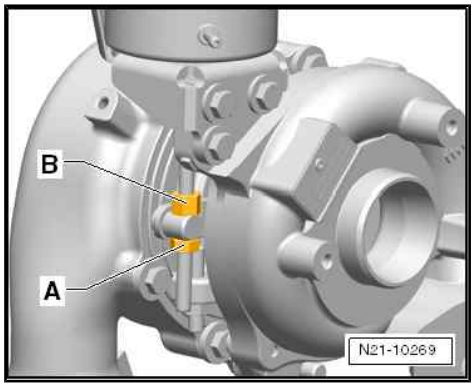
It is important that you counterhold connection when loosening oil supply line. Risk of further damage occurring later.



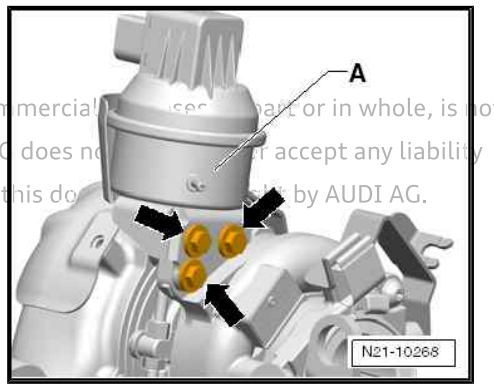
– Counterhold connection using open end spanner - T10461- and unscrew oil supply line -arrow- from turbocharger.
– Seal opening for oil supply line in turbocharger with plug from replacement part kit.



– Counterhold lock nut -B- with ring spanner - T10423- and remove securing nut -A- from control rod using socket - T10422- .



– Unscrew bolts -arrows- securing vacuum unit and detach vacuum unit -A-.



Installing

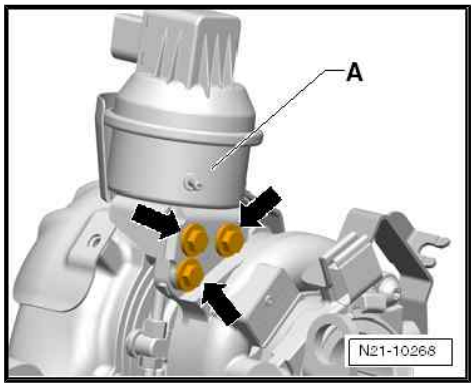
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Caution

Only use new bolts and nuts from replacement part kit.

– If necessary, remove bottom nut securing control rod from new vacuum unit.
– Screw lock nut on control rod by hand as far as stop towards vacuum unit.
– Guide control rod through adjusting lever on turbocharger, fit vacuum unit -A- and secure bolts.

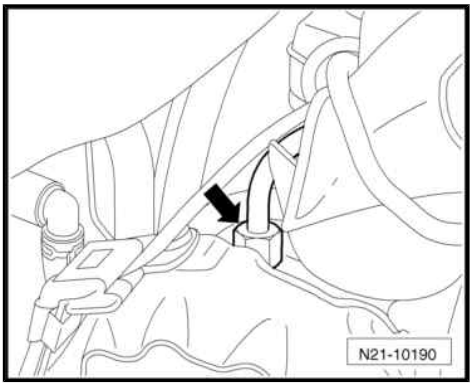
– Tighten securing bolts -arrows- to 8 Nm.



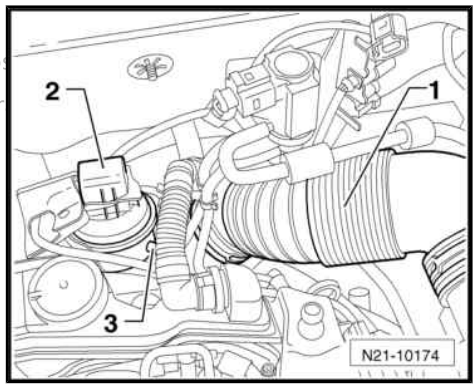
Note

Please ensure that guide can be moved easily on control rod.

– Remove protective cap, fit oil supply line -arrow- on turbocharger and tighten to 22 Nm.



– Plug in connector -2- at position sender for charge pressure positioner - G581- and fasten heat shield sleeve.



– Connect vehicle diagnostic tester.

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Selecting operating mode:

– On touch screen, press button for “Vehicle self-diagnosis”.

Selecting vehicle system:

– On touch screen, press button for “01 - Engine electronics”.

The display will show the identification and coding of the engine control unit.

Selecting diagnostic function:

– On touch screen, press button for “011 - Measured values”.

– On the numeric keypad, enter measured value block “120” and confirm your entry with “Q” key.

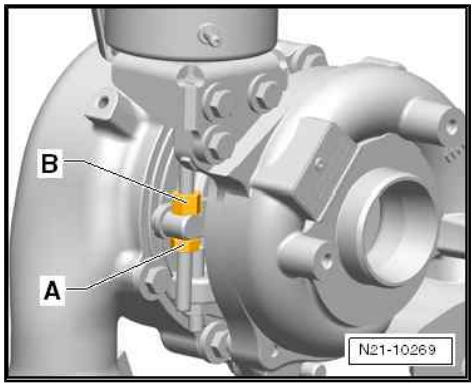
– Connect hand vacuum pump - VAS 6213- to vacuum unit.

– Create voltage of 0.760 V by generating a vacuum (observe minimum value of measured value block).

Caution

During the following adjustment procedure for the control rod, the vacuum and the voltage of 0.760 V must be maintained.

– Slowly screw lock nut -B- for control rod downwards by hand. Adjusting lever is on bottom stop.
– Counterhold lock nut -B- and screw securing nut -A- on control rod against adjusting lever. Tighten slightly using ring spanner - T10423- .
– Release vacuum pressure from vacuum unit.
– Observe minimum value of measured value block: value of 3.30 ... 3.90 V should be displayed (unpressurised).
– Apply socket - T10422- , counterhold lock nut -B- using ring spanner - T10423- and tighten securing nut -A-.

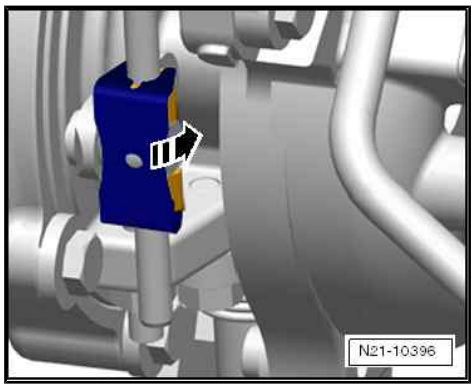


Caution

Create vacuum of 0.75 ± 0.05 bar for vacuum unit to ensure that adjusting lever is positioned at stop. A voltage of 0.760 V should build up.

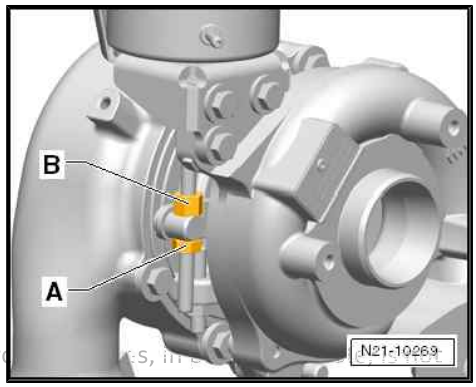
Voltage value OK

– Press locking plate onto control rod by hand and turn by 90° in direction of -arrow-.
– Seal connection between control rod and securing nut with sealing paint from replacement part kit.



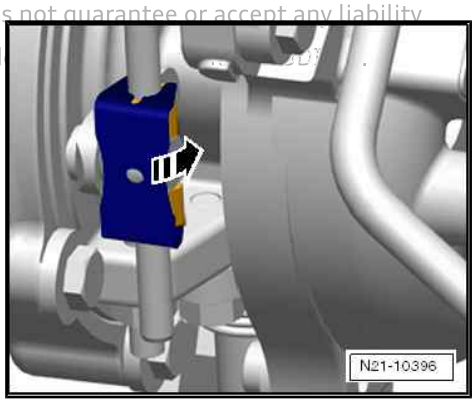
Voltage value not OK

– Counterhold lock nut -B-, loosen securing nut -A- on control rod and adjust value by turning lock nut -B-.
– Counterhold lock nut -B-, screw securing nut -A- in other direction and tighten connection using socket - T10422- .

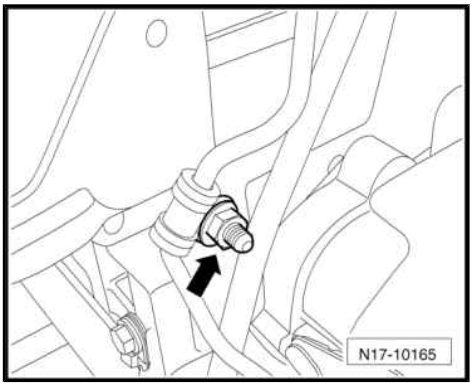


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– Press locking plate onto control rod by hand and turn by 90° in direction of -arrow-.
– Seal connection between control rod and securing nut with sealing paint from replacement part kit.



Continued



– Depending on version, fit nut -arrow- securing oil supply line/ vacuum line to cylinder head and tighten connection.
– Remove sealing cap from turbocharger.
– Fully assemble engine components.
– Start engine and erase event memory ⇒ Vehicle diagnostic tester.
– Check adjustment as follows:

Selecting diagnostic function:

– On touch screen, press button for “006 - Basic setting”.
– On the numeric keypad, enter measured value block “120” and confirm your entry with “Q” key.
– On bottom half of touch screen, press button for “Activate”.
– Observe value on bottom part of display: value should fluctuate between 0.65 ... 0.85 V and 3.30 ... 3.90 V (vacuum unit is moved to both limit stops alternately).

Voltage values OK:

– Exit basic setting.

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3 Charge air cooling

Overview

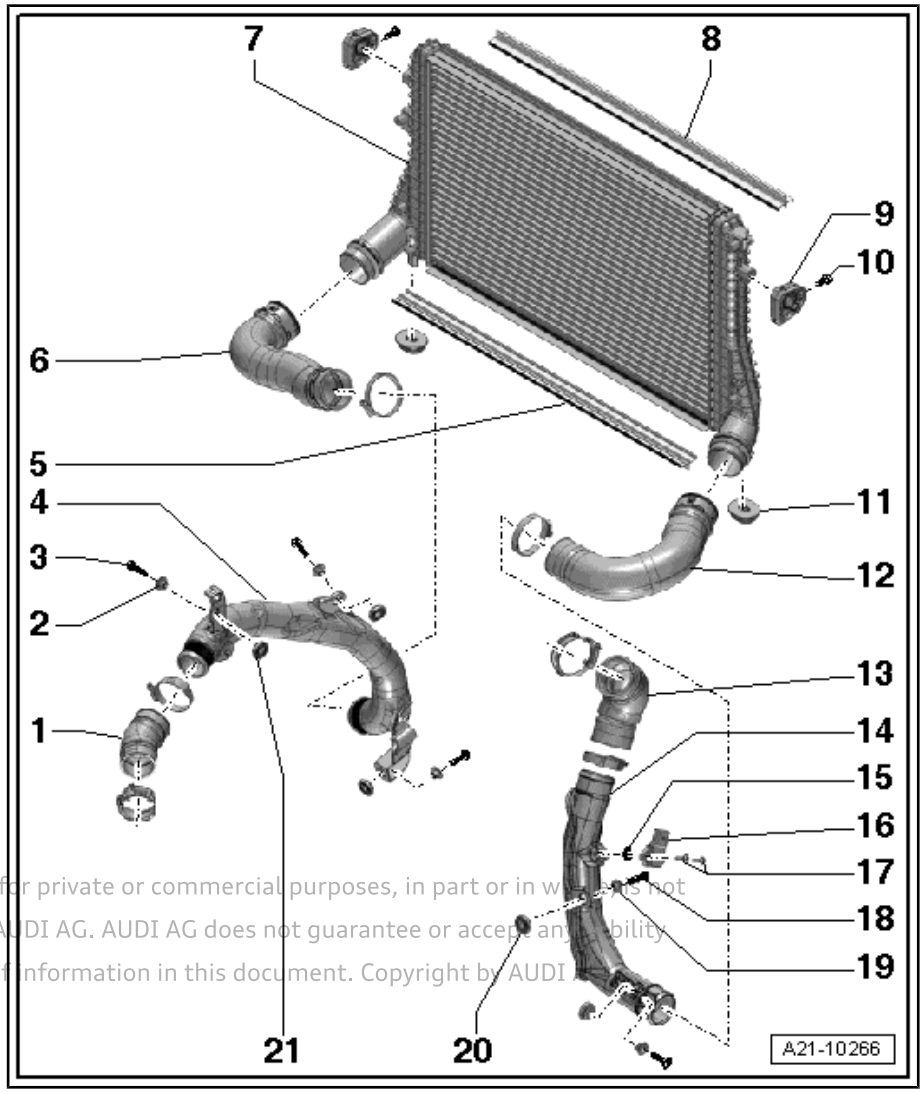
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- ⇒ “3.1 Exploded view - charge air cooler”, page 268
- ⇒ “3.2 Removing and installing charge pressure sender G31 / intake air temperature sender G42”, page 270
- ⇒ “3.3 Removing and installing charge air cooler”, page 272
- ⇒ “3.4 Checking charge air system for leaks”, page 273

Note

- *Check that all air pipes and hoses and vacuum lines are correctly fitted and that there are no leaks before carrying out tests or repairs.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

3.1 Exploded view - charge air cooler



1 - Air hose

2 - Sleeve

3 - Bolt

- ❑ 9 Nm

4 - Air pipe (left-side)

5 - Seal

6 - Air hose

- ❑ Removing ⇒ page 270
- ❑ Installing ⇒ page 270

7 - Charge air cooler

- ❑ Removing and installing ⇒ page 272

8 - Seal

9 - Mounting

10 - Bolt

- ❑ 5 Nm

11 - Mounting

12 - Air hose

- ❑ Removing ⇒ page 270
- ❑ Installing ⇒ page 270

13 - Air hose

14 - Air pipe

15 - O-ring

- ❑ Renew

16 - Charge pressure sender - G31- / intake air temperature sender - G42-

- ❑ Removing and installing ⇒ page 270

17 - Bolt

- ❑ 5 Nm

18 - Bolt

- ❑ 9 Nm

19 - Sleeve

20 - Grommet

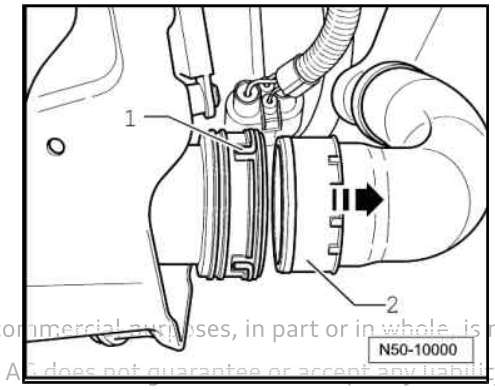
- ❑ Renew if damaged

21 - Grommet

- ❑ Renew if damaged

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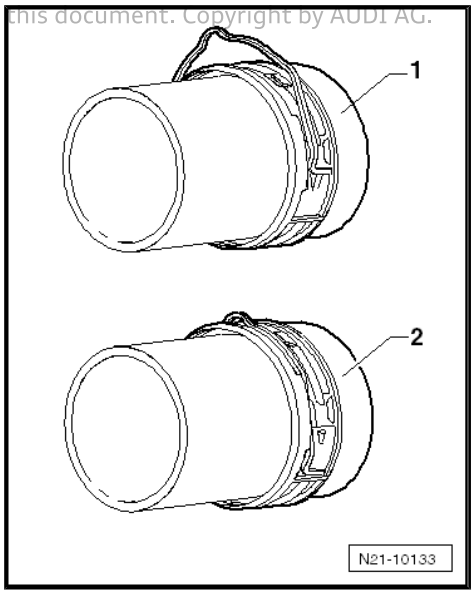
Removing air pipes/hoses with plug-in connectors



– Release plug-in connector by pulling out retaining clip -1-.
– Disconnect air pipe/hose -2- -arrow- by hand (do not use a tool).

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Installing air hoses with plug-in connectors



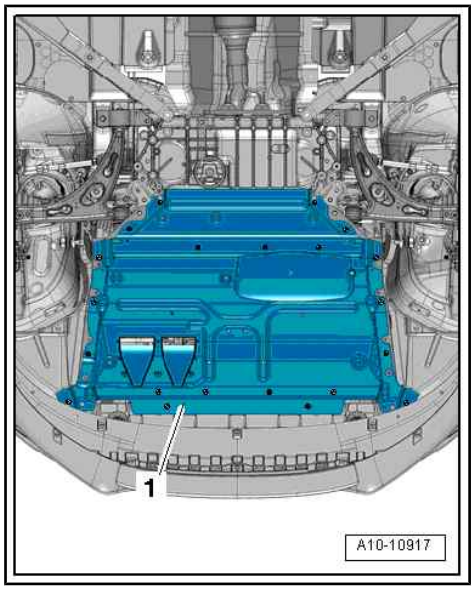
Note

- *Renew seal if damaged.*
- *Make sure that the seal is correctly seated in the groove on the complete circumference of the air pipe/hose.*
- *Apply a thin coating of silicon-free lubricant to the sealing area and the seal.*

– Release retaining clip (position -1-).
– Push air pipe/hose in as far as stop and press retaining clip to lock -2-.
– Press air pipe/hose again and pull again to check that plug-in connector is correctly engaged.

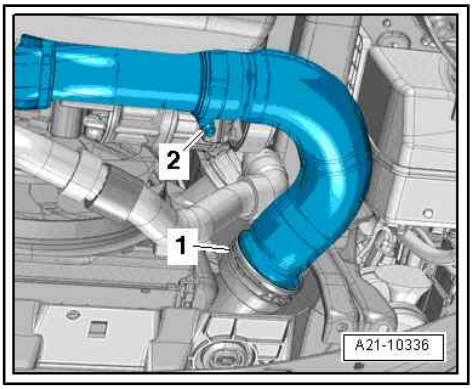
3.2 Removing and installing charge pressure sender - G31- / intake air temperature sender - G42-

Removing

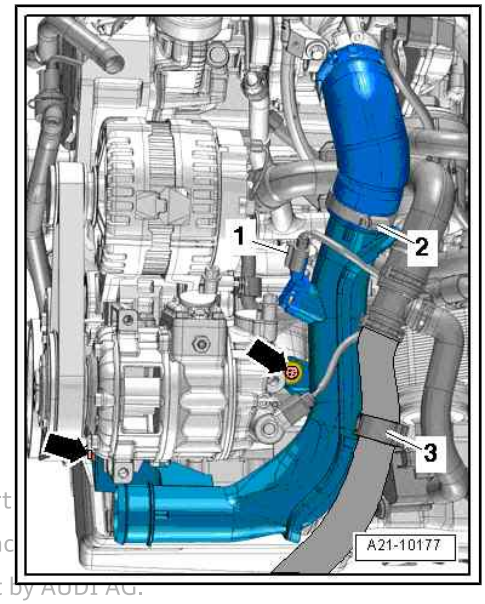


– Remove noise insulation -1- ⇒ Rep. gr. 50 .

– Release hose clip -2-, lift retaining clip -1- and remove air hose.

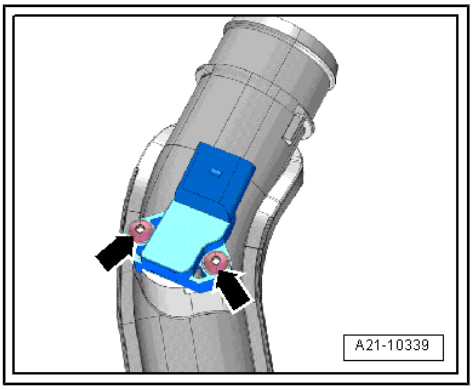


– Remove bolts -arrows-.
– Move coolant hose -3- clear.
– Release hose clip -2-.
– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe (front).



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– Remove bolts -arrows- and pull charge pressure sender - G31- / intake air temperature sender - G42- out of air pipe.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

◆ ⇒ “3.1 Exploded view - charge air cooler”, page 268

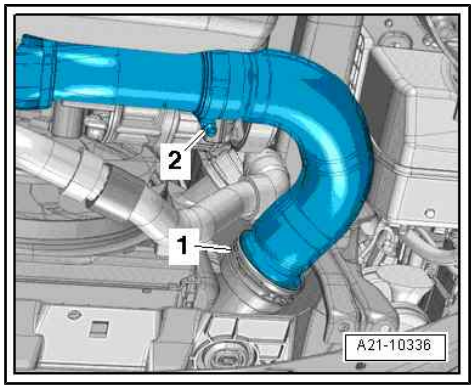
Note

Fit new O-ring.

– Install air pipe (front) ⇒ page 268 .
– Install noise insulation ⇒ Rep. gr. 50 .

3.3 Removing and installing charge air cooler

Removing

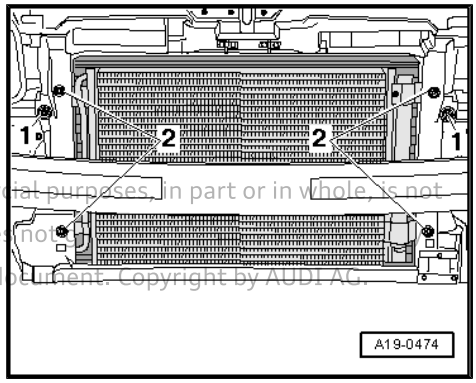


– Remove radiator ⇒ page 232 .
– Remove bumper cover (front) ⇒ Rep. gr. 63 .
– Unbolt air ducts on left and right sides of charge air cooler.
– Release hose clip -2-, lift retaining clip -1- slightly and remove air hose.

WARNING

Risk of injury caused by refrigerant.

- *The air conditioner refrigerant circuit must not be opened.*



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Caution

Risk of damage to condenser and refrigerant pipes/hoses.

- *Do NOT stretch, kink or bend refrigerant lines and hoses.*

– Remove bolts -1- for charge air cooler and -2- for condenser.
– Pivot charge air cooler slightly to the rear, disengage from mountings by pulling upwards, and take out from below.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

- ⇒ “3.1 Exploded view - charge air cooler”, page 268

Note

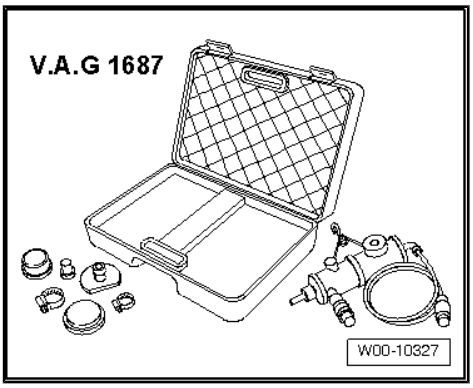
- *If there are slight impressions on the fins, refer to ⇒ page 7 .*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

– Install condenser ⇒ Rep. gr. 87 .
– Install bumper cover (front) ⇒ Rep. gr. 63 .
– Install air hose with plug-in connector ⇒ page 270 .
– Install radiator ⇒ page 232 .

3.4 Checking charge air system for leaks

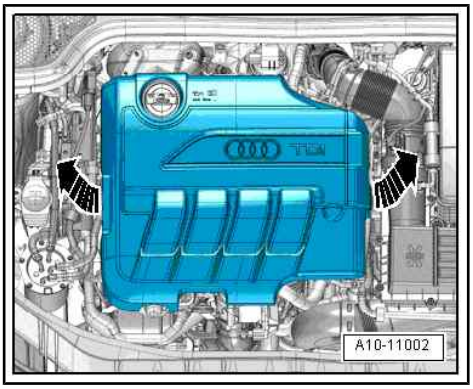
Special tools and workshop equipment required

- Charge air system tester - V.A.G 1687- with adapter - V.A.G 1687/12-

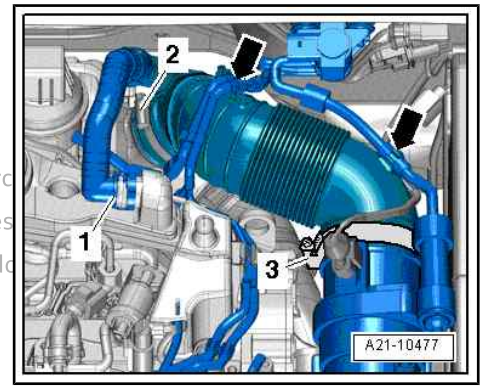


Procedure

– Remove engine cover panel -arrows-.

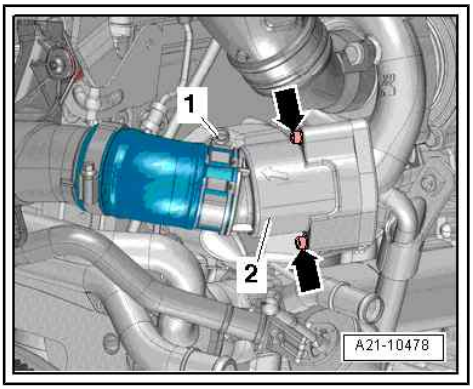


– Press release tabs and disconnect crankcase breather hose -1- from cylinder head cover.
– Move clear vacuum hoses -arrows- at air pipe.
– Loosen hose clips -2- and -3- and detach air pipe.

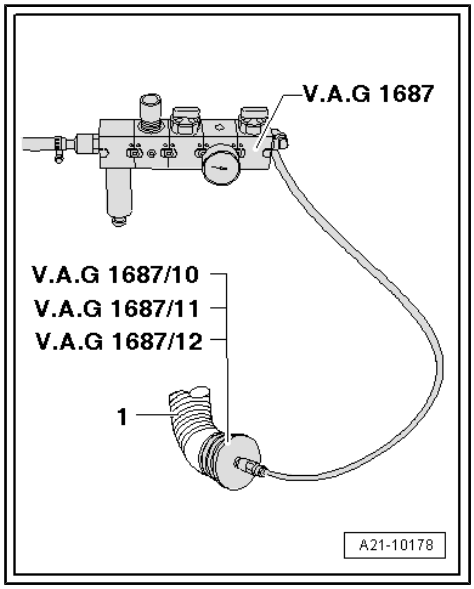


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– Remove bolts -arrows-.
– Loosen hose clip -1- and detach pulsation damper.



– Insert adapter - 1687/12- into air hose -1- and secure with hose clip.
– Connect charge air system tester - V.A.G 1687- to adapter.



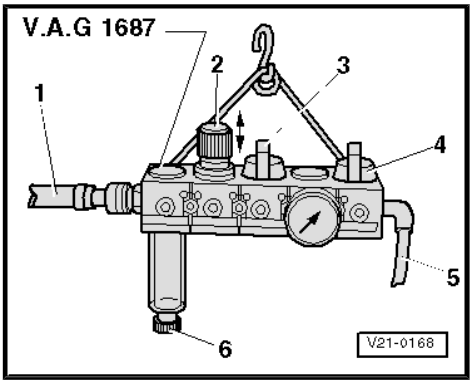
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Prepare charge air system tester - V.A.G 1687- as follows:

– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

• Make sure knob is pulled out before turning pressure control valve -2-.

– Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.



Note

If there is water in sight glass, remove drain plug -6- and drain water.

– Open valve -3-.

Caution

Risk of damage if pressure is set too high.

- ***The pressure must not exceed 0.5 bar.***

– Adjust pressure to 0.5 bar via pressure control valve -2-.

– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.5 bar again.

– Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detection spray or use ultrasonic tester - V.A.G 1842- .

Note

- *A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.*
- *For operation of ultrasonic tester -V.A.G 1842- , refer to ⇒ Operating instructions .*
- *Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.*

Assembling

Installation is carried out in the reverse order; note the following:

Note

- *Renew gasket and O-ring.*
- *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *The screw sections of used screw-type clips must be sprayed with rust remover prior to fitting so that the air hoses can be attached securely to the hose connections.*

– Install pulsation damper ⇒ page 239 .

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26 – Exhaust system

1 Silencers - vehicles with engine codes CBAA, CBAB, CBBB

Overview

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- ⇒ “1.1 Exploded view - silencers”, page 276
- ⇒ “1.2 Removing and installing particulate filter”, page 279
- ⇒ “1.3 Renewing flexible joint”, page 285
- ⇒ “1.4 Separating centre and rear silencers”, page 287
- ⇒ “1.5 Stress-free alignment of exhaust system”, page 288
- ⇒ “1.6 Aligning tailpipes”, page 288
- ⇒ “1.7 Checking exhaust system for leaks”, page 288

Note

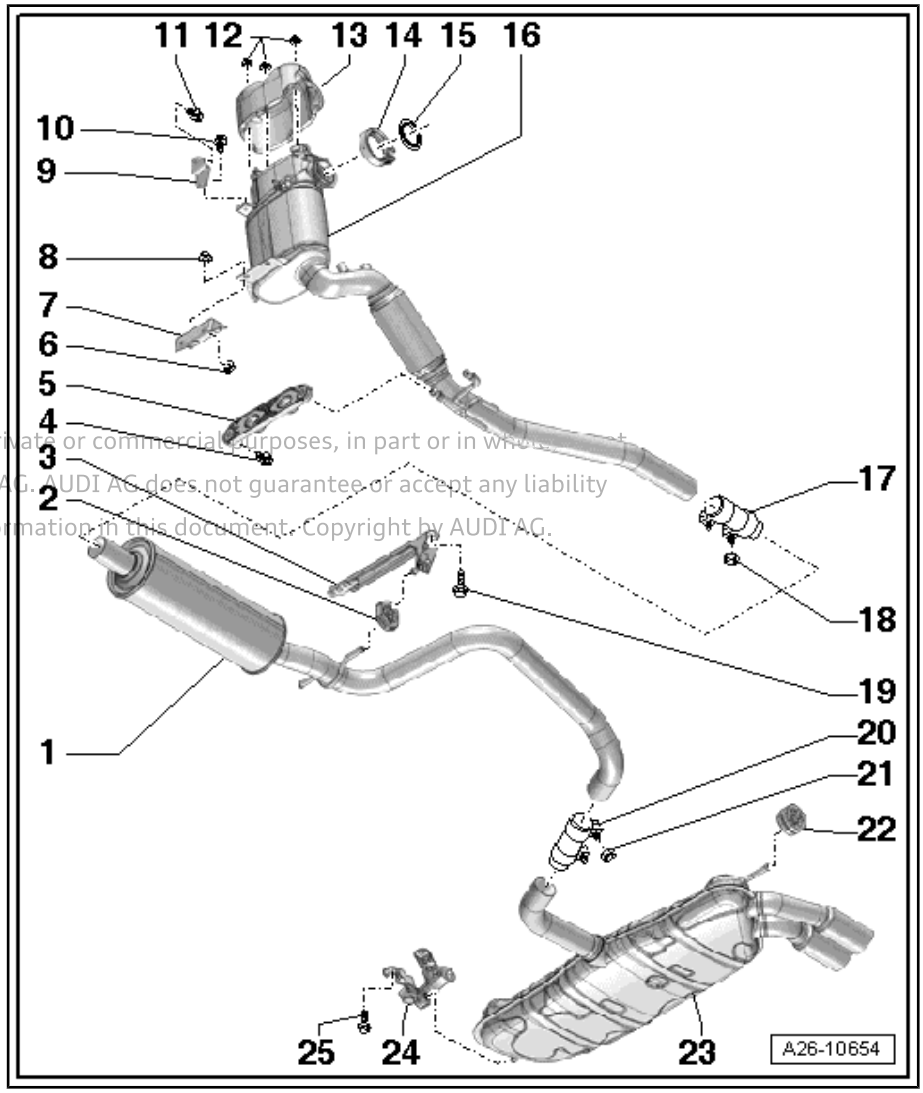
- *After working on the exhaust system, ensure that the system is not under stress and that it has sufficient clearance from the body. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the body at all points and the mountings are evenly loaded.*
- *Use screwdriver to unfasten and tighten clamping washers for heat shields. Tightening torque: 2 Nm*

1.1 Exploded view - silencers

WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ “2.5 Safety precautions when working on the exhaust system”, page 4 .



1 - Centre silencer

- ❑ Combined in one unit with rear silencer as original equipment. Can be renewed separately for repair purposes
- ❑ Cutting point ⇒ page 287
- ❑ Align exhaust system so it is free of stress ⇒ page 288

2 - Rubber mounting

- ❑ Renew if damaged

3 - Mounting

4 - Bolt

- ❑ 23 Nm

5 - Bracket

- ❑ Renew if damaged

6 - Nut

- ❑ 23 Nm

7 - Bracket (bottom)

- ❑ For particulate filter

8 - Nut

- ❑ 23 Nm

9 - Bracket (top)

- ❑ For particulate filter

10 - Bolt

- ❑ 23 Nm

11 - Bolt

- ❑ 23 Nm

12 - Nuts

- ❑ 9 Nm

13 - Heat shield

14 - Clamp

- ❑ For particulate filter
- ❑ Renew
- ❑ Installation position ⇒ page 279
- ❑ 7 Nm

15 - Seal

- ❑ Renew

16 - Particulate filter with catalytic converter

- ❑ Removing and installing ⇒ page 279
- ❑ After renewing, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester
- ❑ Detach flexible joint from particulate filter ⇒ page 285

17 - Clamp (front)

- ❑ Before tightening, align exhaust system so it is free of stress ⇒ page 288
- ❑ Installation position ⇒ page 278
- ❑ Tighten bolted connections evenly

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18 - Nut

- ❑ 23 Nm

19 - Bolt

- ❑ 23 Nm

20 - Clamp (rear)

- ❑ For separate replacement of centre and rear silencers
- ❑ Installation position ⇒ page 278
- ❑ Tighten bolted connections evenly

21 - Nut

- ❑ 23 Nm

22 - Rubber mounting

- ❑ Renew if damaged

23 - Rear silencer

- ❑ Combined in one unit with centre silencer as original equipment. Can be renewed separately for repair purposes
- ❑ Cutting point ⇒ page 287
- ❑ Align exhaust system so it is free of stress ⇒ page 288

24 - Mounting

- ❑ Renew if damaged

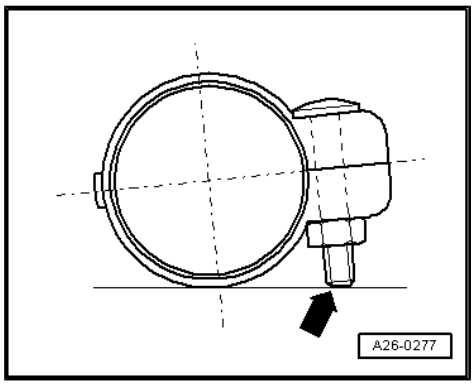
25 - Bolt

- ❑ 23 Nm

Installation position of front clamp

– Install clamp so that ends of bolts do not protrude beyond bottom of clamp -arrow-.

• Bolted connection facing towards right

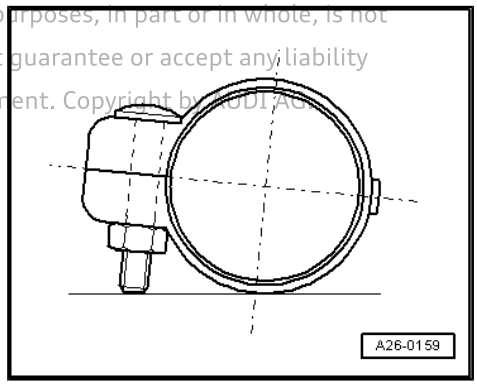


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Installation position of rear clamp

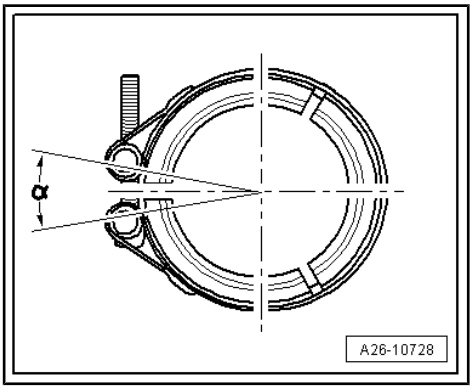
– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

• Bolt connection faces to rear



Installation position of clamp for particulate filter

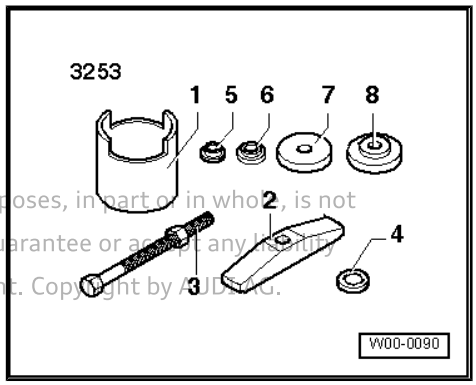
- Angle -α- = 0 ± 10°



1.2 Removing and installing particulate filter

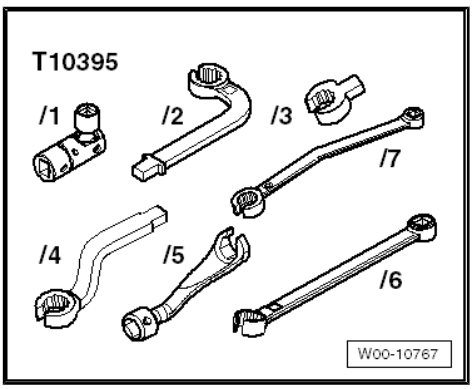
Special tools and workshop equipment required

♦ -3253/5- from assembly tool - 3253-



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♦ Tool set, 17 mm - T10395-



♦ Flange bolt M10x35

Removing

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 4 .

– Remove Lambda probe ⇒ Rep. gr. 23 .

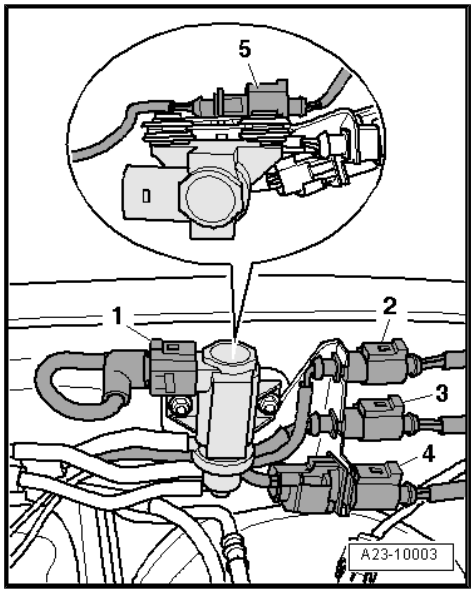
Vehicles with four-wheel drive:

– Remove propshaft ⇒ Rear final drive 02D, 0AV, 0BR and 0BY; Rep. gr. 39 .

– Remove bevel box ⇒ Rep. gr. 34 .

All vehicles (continued):

– Unplug electrical connector -5- for exhaust gas temperature sender 3 - G495- and move electrical wiring clear.



Note

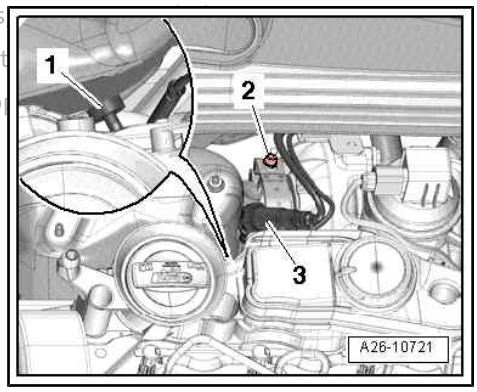
Disregard items -1 ... 4-.

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– Slacken bolt -2- and remove clamp.

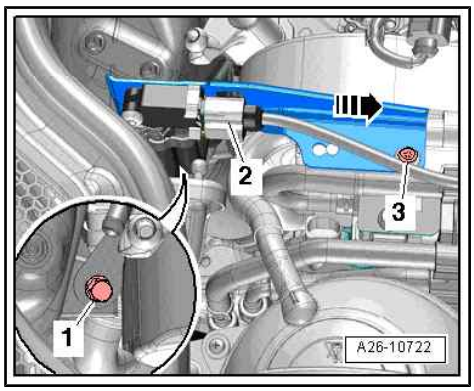
Note

Disregard items -1 and 3-.



– Unplug electrical connector -2- on exhaust gas pressure sensor 1 - G450- .

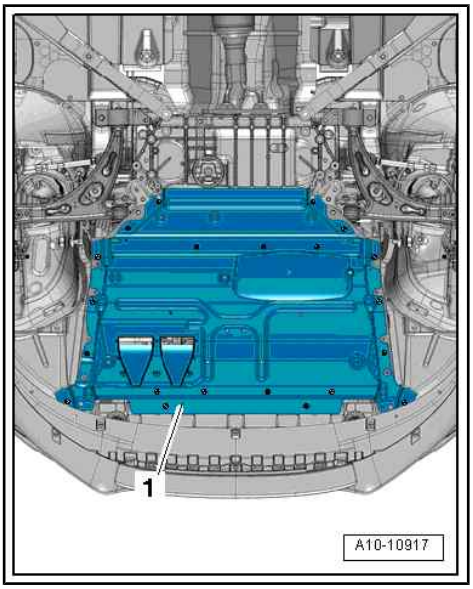
– Remove bolts -1- and -3- and detach exhaust gas pressure sensor 1 - G450- from bracket -arrow-.



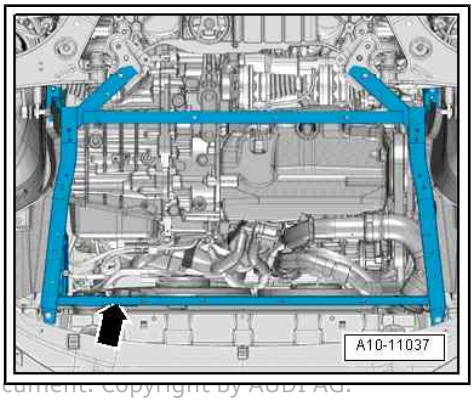
Vehicles with front-wheel drive:

– Remove front right wheel.

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

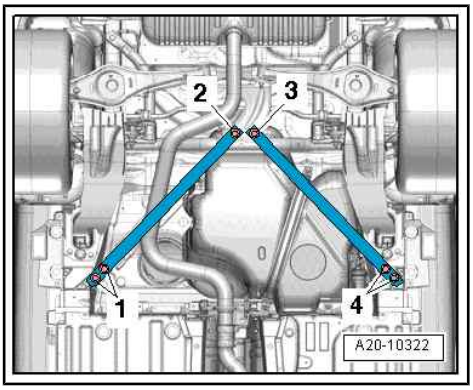


– A3 Cabriolet: Remove noise insulation frame -arrow- ⇒ Rep. gr. 50 .



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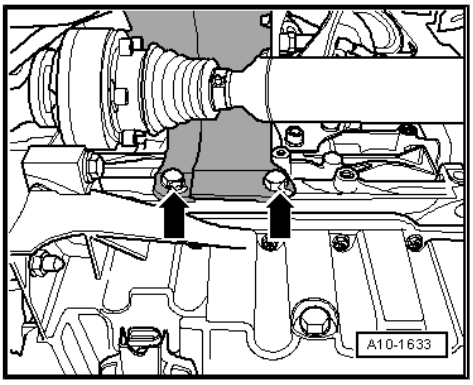
– A3 Cabriolet: Remove bolts -1- and -2- and take off diagonal strut (left-side).



– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).

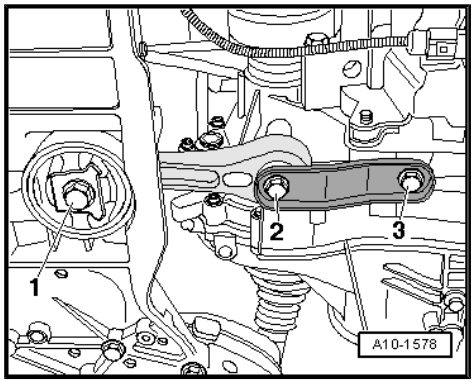
– Unbolt drive shaft (right-side) from gearbox flange.

– Push drive shaft (right-side) towards the front.



All vehicles (continued):

– Remove bolts -2- and -3- securing pendulum support.

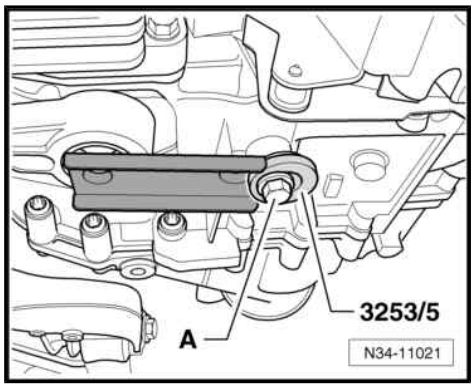


Note

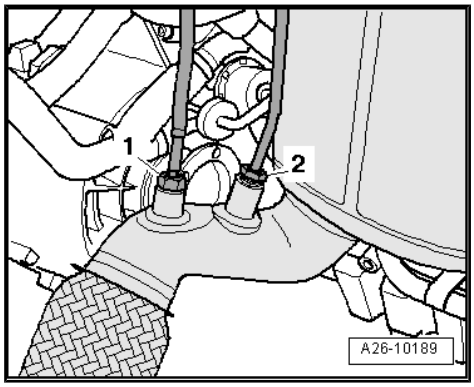
Disregard -item 1-.

– Press engine/gearbox assembly towards lock carrier and support via pendulum support as shown in illustration.

A - Flange bolt M10x35



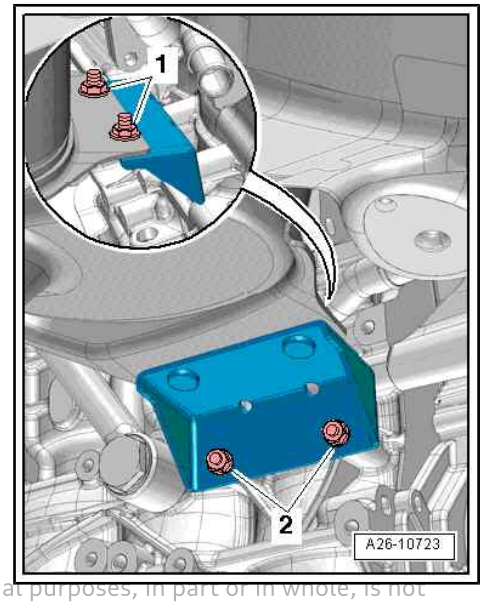
– Unscrew exhaust gas temperature sender 4 - G648- -item 1- from exhaust pipe behind particulate filter using a tool from tool set, 17 mm - T10395- .



Note

Disregard -item 2-.

– Remove nuts -1- and -2- and detach bracket for particulate filter.

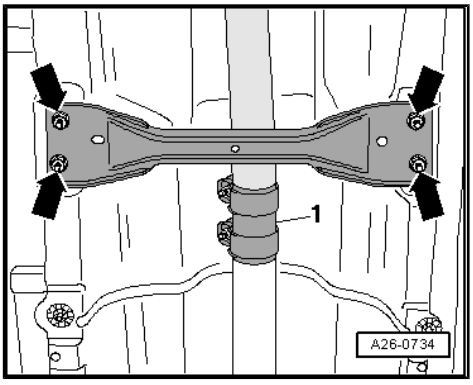


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Caution

Risk of damage to flexible joint.

- *Do NOT bend flexible joint in front exhaust pipe more than 10°.*

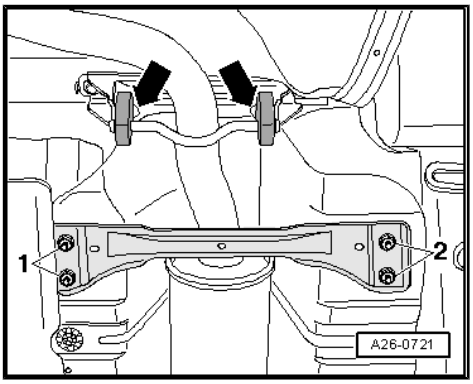


– Loosen nuts for clamp -1- and push clamp to rear.

Note

Disregard -arrows-.

– Remove nuts -1- and -2- and detach rear cross member on vehicle underside.



Note

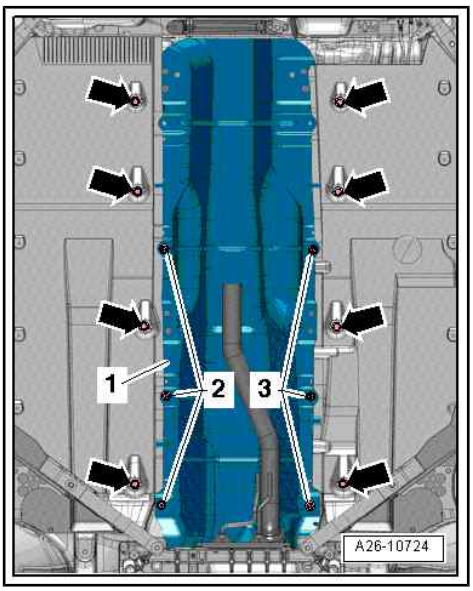
A second person will be required for detaching rear section of exhaust system.

– Unhook rear silencer and centre silencer at rubber mountings -arrows- and remove rear section of exhaust system.

– Remove nuts -arrows-.

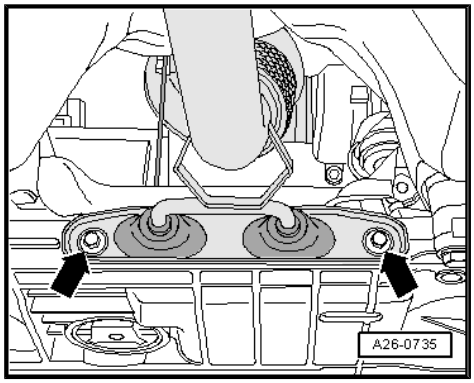
– Remove clamping washers -2- and -3-.

– Pull inner side of cover on vehicle underside down slightly until heat shield -1- for centre tunnel can be detached.

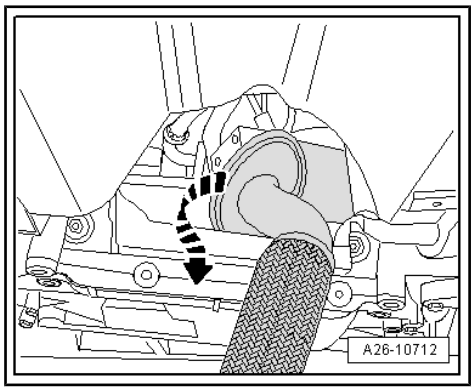


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– Remove bolts -arrows- securing bracket for exhaust system.



– Remove particulate filter by rotating through 180° and about its own axis.



Installing

Installation is carried out in reverse order; note the following:

Tightening torque

- ⇒ “1.1 Exploded view - silencers”, page 276

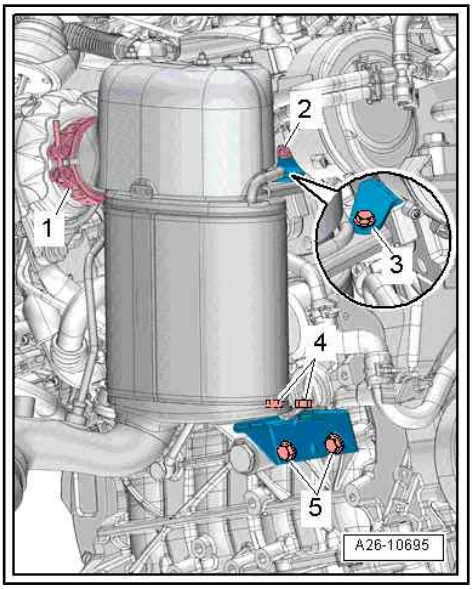
Note

- *Renew gaskets, self-locking nuts and clamp for particulate filter.*
- *Fit all cable ties in the original positions when installing.*

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– Note sequence when installing particulate filter:

1.	Fit particulate filter to turbocharger, attach clip -1- without tightening
2.	Fit bolts -2 ... 5- by hand without tightening • It must still be possible to move particulate filter and bracket
3.	Tighten clamp -1-
4.	Tighten bolts -2- and -5-.
5.	Tighten bolts -3- and -4-.



– Install underbody cover ⇒ Rep. gr. 66 .
– A3 Cabriolet: Install noise insulation frame ⇒ Rep. gr. 50 .
– Install pendulum support ⇒ Rep. gr. 34 .
– A3 Cabriolet: Install diagonal strut ⇒ Rep. gr. 42 .
– Install exhaust gas temperature sender 4 - G648- ⇒ page 295 .

Vehicles with front-wheel drive:

– Install drive shaft ⇒ Rep. gr. 40 .
– Install heat shield for drive shaft (right-side) ⇒ page 40 .
– Fit front wheel (right-side) ⇒ Wheels and tyres; Rep. gr. 44 .

Vehicles with four-wheel drive:

– Install bevel box ⇒ Rep. gr. 34 .
– Install propshaft ⇒ Rear final drive 02D, 0AV, 0BR and 0BY; Rep. gr. 39 .

All vehicles (continued):

– Align the exhaust system so it is free of stress ⇒ page 288 .
– Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Install Lambda probe - G39- and exhaust gas pressure sensor 1 - G450- ⇒ Rep. gr. 23 .
– After renewing particulate filter, perform `Adaption` in `Guided Functions` ⇒ Vehicle diagnostic tester.

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1.3 Renewing flexible joint

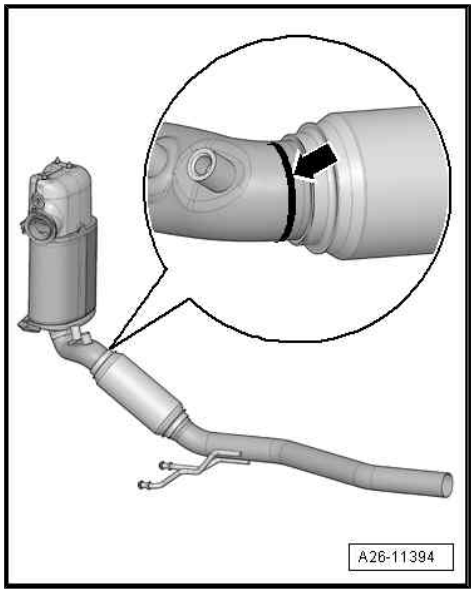
WARNING

When working on all parts of the exhaust system:

- ***Observe safety precautions when working on the exhaust system***
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 4 .

– Remove particulate filter ⇒ page 279 .

– Cut through particulate filter at point indicated by -arrow- in illustration by applying angle grinder to weld seam for flexible joint.
– Deburr cutting point on particulate filter and clean if necessary.
– Refit particulate filter (just bring it into installation position).
– Install flexible joint with transport lock (just bring it into installation position and align it stress-free).



Caution

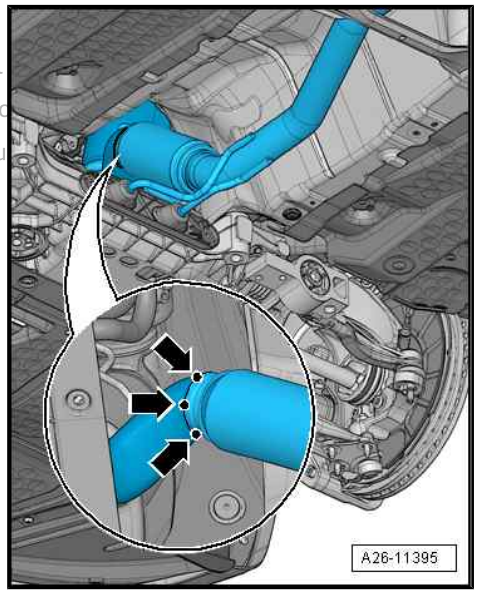
Warning! Component can be damaged before installation

Transport lock must not be removed until particulate filter has been fully installed.

Note

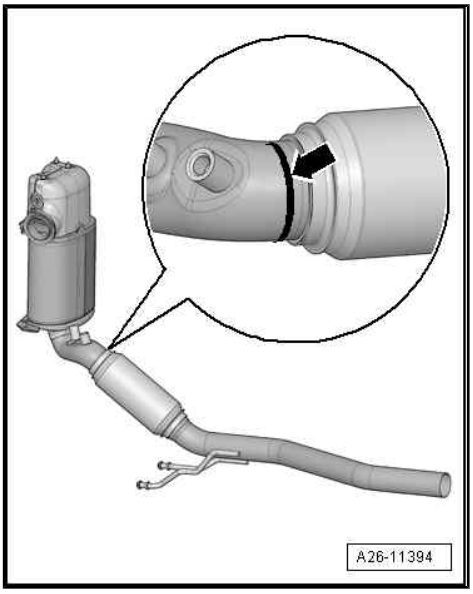
Use welding wire, Albronze - V.A.G 1867- or welding wire, Albronze - V.A.G 1867/1- for welding work.

– Join both parts with 3 or more single welds, as shown in illustration -arrows-.
– Remove flexible joint with particulate filter again.



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– Arc-weld continuous seam, as shown in illustration -arrow-.



Caution

Warning! Component can be damaged before installation

Transport lock must not be removed until particulate filter has been fully installed.

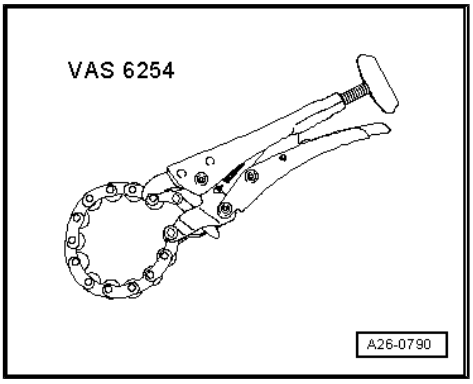
– Install particulate filter ⇒ page 279 .
– Check exhaust system for leaks.

1.4 Separating centre and rear silencers

- The connecting pipe can be cut through at the cutting point in order to renew the centre or rear silencer separately.
- The cutting point is marked by an indentation on the outside of the exhaust pipe.

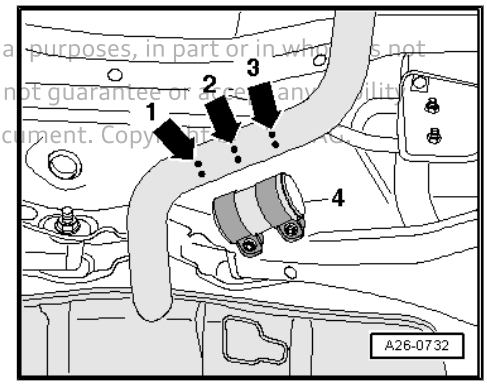
Special tools and workshop equipment required

- Chain pipe cutter - VAS 6254-



Procedure

– Cut through exhaust pipe at right angles at the position marked -arrow 2- using chain pipe cutter - VAS 6254-.
– Position clamp -4- at side marks when installing -arrow 1- and -arrow 3-.

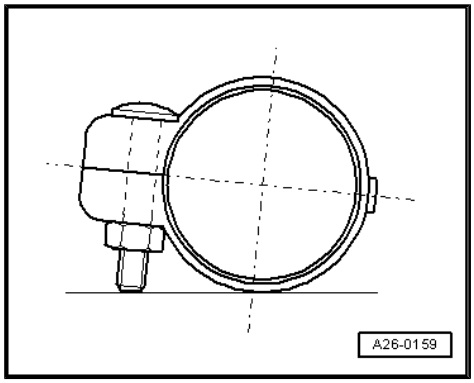


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– Install clamp so that ends of bolts do not protrude beyond bottom of clamp.

• Bolt connection faces to rear

– Align the exhaust system so it is free of stress ⇒ page 288 .



1.5 Stress-free alignment of exhaust system

Procedure

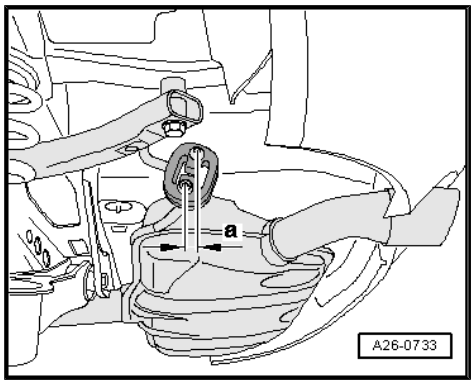
• The exhaust system must be aligned when it is cool.

Tightening torque

◆ ⇒ “1.1 Exploded view - silencers”, page 276

– Loosen bolted connections on front clamp.

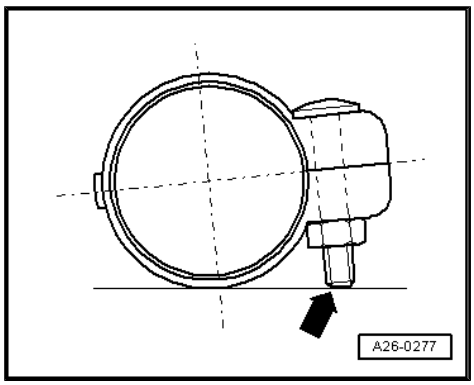
– Push exhaust system towards front of vehicle until preloading at mounting for rear silencer -a- = 15 ... 17 mm.



– Install clamp so that ends of bolts do not protrude beyond bottom of clamp -arrow-.

• Bolted connection facing towards right

– Tighten bolt connections on clamp evenly.

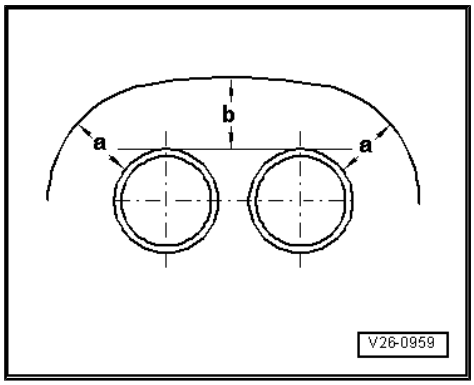


1.6 Aligning tailpipes

Procedure

– Align rear silencer so that there is an equal distance -a- and -b- between bumper cut-out and tailpipes.

– Unfasten rear silencer mounting to align tailpipes.



1.7 Checking exhaust system for leaks

– Start the engine and run at idling speed.

– Plug tailpipes during leak test (e.g. with cloth or plug).

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– Listen for noise at the connection points of cylinder head/exhaust manifold, turbocharger/front exhaust pipe etc. to locate any leaks.
– Rectify any leaks that are found.



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2 Exhaust gas temperature control - vehicles with engine codes CBAA, CBAB, CBBB

Overview

- ⇒ “2.1 Exploded view - exhaust gas temperature control”, page 290
- ⇒ “2.2 Removing and installing exhaust gas temperature sender 1 G235 ”, page 292
- ⇒ “2.3 Removing and installing exhaust gas temperature sender 3 G495 ”, page 293
- ⇒ “2.4 Removing and installing exhaust gas temperature sender 4 G648 ”, page 295

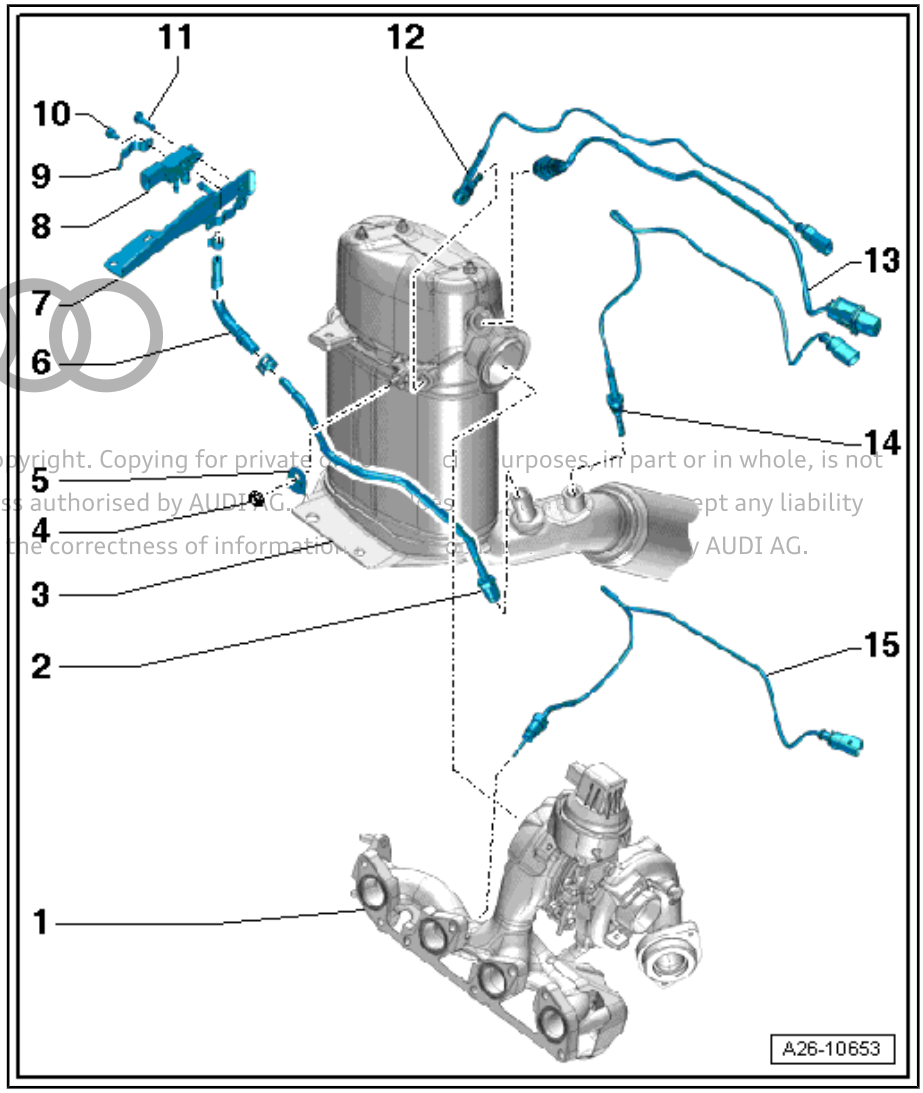
2.1 Exploded view - exhaust gas temperature control

WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system ⇒ “2.5 Safety precautions when working on the exhaust system”, page 4 .*

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1 - Turbocharger

2 - Control pipe

- ❑ 45 Nm

3 - Particulate filter

4 - Nut

- ❑ 9 Nm

5 - Bracket

- ❑ Bolted to particulate filter

6 - Hose

7 - Bracket

- ❑ For exhaust gas pressure sensor 1 - G450-

8 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing ⇒ Rep. gr. 23

9 - Bracket

10 - Bolt

- ❑ 4.5 Nm

11 - Bolt

- ❑ 8 Nm

12 - Exhaust gas temperature sender 3 - G495-

- ❑ Removing and installing ⇒ page 293
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

13 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ Rep. gr. 23

14 - Exhaust gas temperature sender 4 - G648-

- ❑ Removing and installing ⇒ page 295
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

15 - Exhaust gas temperature sender 1 - G235-

- ❑ Removing and installing ⇒ page 292
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ 45 Nm

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2.2 Removing and installing exhaust gas temperature sender 1 - G235-

Removing

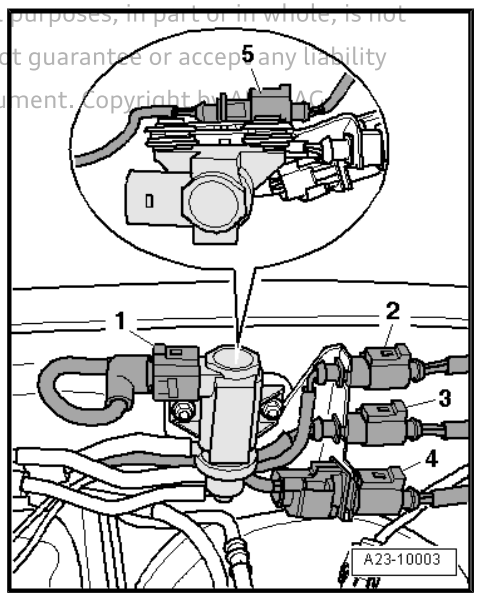
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 4 .

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– Unplug electrical connector -3- for exhaust gas temperature sender 1 - G235- and move electrical wiring clear.



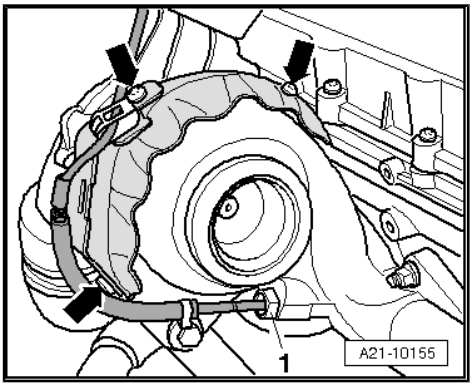
Note

Disregard -items 1, 2, 4, 5-.

Note

The connection can be accessed from below.

– Unscrew exhaust gas temperature sender 1 - G235- -item 1- from exhaust manifold.



Note

Disregard -arrows-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

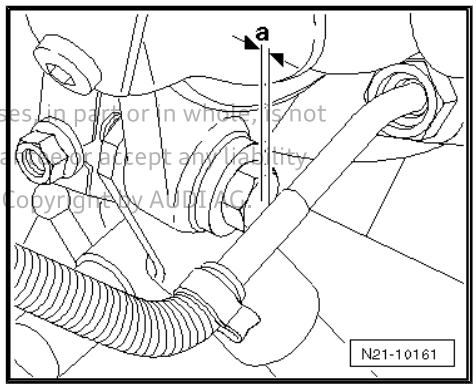
- ⇒ “2.1 Exploded view - exhaust gas temperature control”, page 290

Note

- *Coat threads of exhaust gas temperature sender with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*
- *Fit all cable ties in the original positions when installing.*

Installation position of exhaust gas temperature sender -G235- :

- The angled part of the pipe must have a clearance of -a- = 3 … 5 mm from the bolt on the turbocharger support.

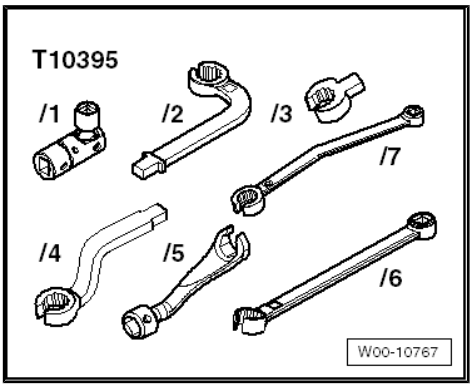


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2.3 Removing and installing exhaust gas temperature sender 3 - G495-

Special tools and workshop equipment required

- Tool set, 17 mm - T10395-



Removing

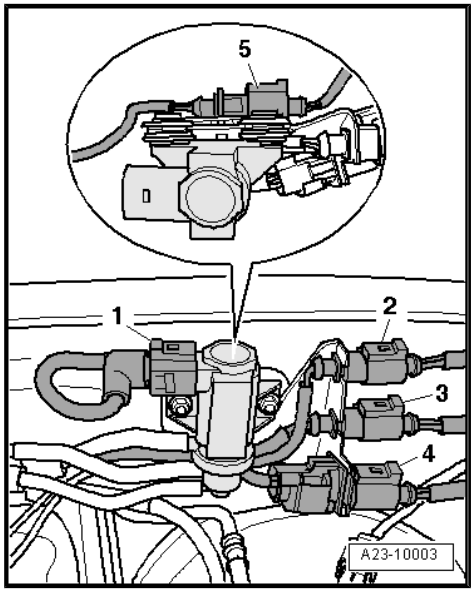
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 4 .

– Remove Lambda probe - G39- ⇒ Rep. gr. 23 .

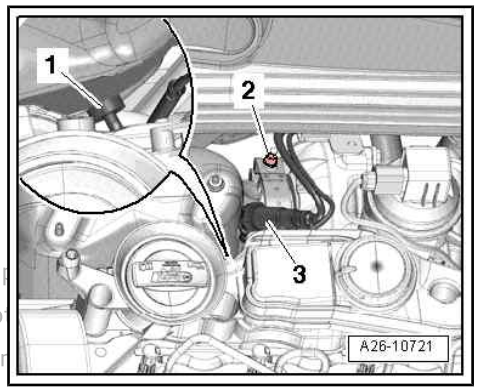
– Unplug electrical connector -5- for exhaust gas temperature sender 3 - G495- and move electrical wiring clear.



Note

Disregard items -1 ... 4-.

– Unscrew exhaust gas temperature sender 3 - G495- -item 1- using a tool from tool set, 17 mm - T10395- .



Note

Disregard items -2 and 3-.

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Installing

Installation is carried out in reverse order; note the following:

Tightening torque

- ⇒ "2.1 Exploded view - exhaust gas temperature control", page 290

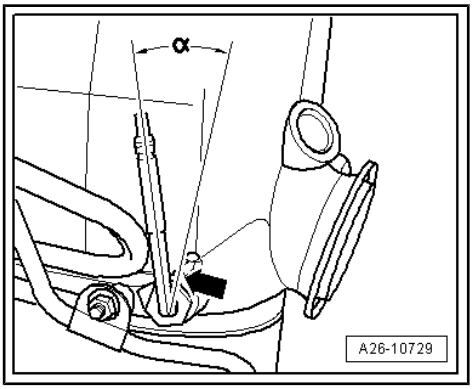
Note

- *Coat threads of temperature sender with high-temperature paste ⇒ Electronic parts catalogue .*
- *Fit all cable ties in the original positions when installing.*

Installation position of exhaust gas temperature sender 3 - G495- :

- Angled section of pipe faces towards left side of vehicle.
- Angle -α- between pipe and marking -arrow- = approx. 17°.

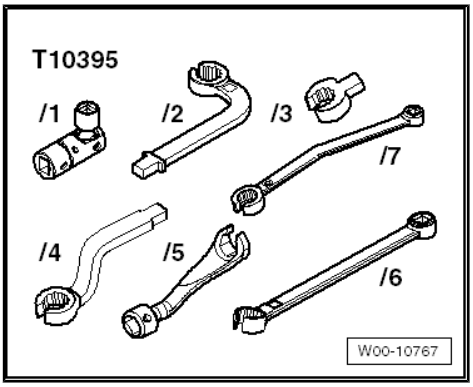
– Install Lambda probe - G39- ⇒ Rep. gr. 23



2.4 Removing and installing exhaust gas temperature sender 4 - G648-

Special tools and workshop equipment required

♦ Tool set, 17 mm - T10395-



Removing

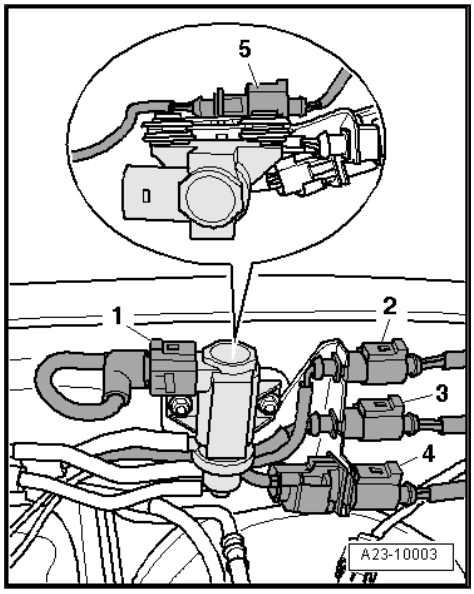
WARNING

When working on all parts of the exhaust system:

- *Observe safety precautions when working on the exhaust system*
  ⇒ "2.5 Safety precautions when working on the exhaust system", page 4 .

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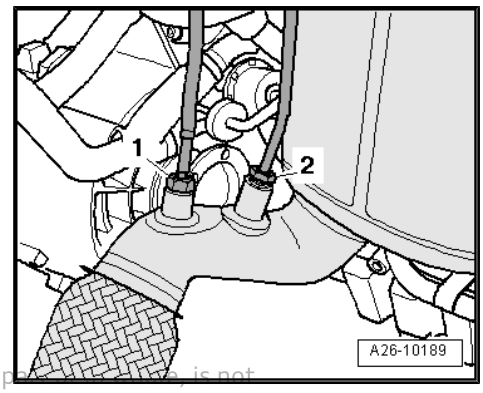
– Unplug electrical connector -2- for exhaust gas temperature sender 4 - G648- and move electrical wiring clear.



Note

Disregard -items 1, 3, 4, 5-.

– Unscrew exhaust gas temperature sender 4 - G648- -item 1- from exhaust pipe behind particulate filter using a tool from tool set, 17 mm - T10395- .



Note

Disregard -item 2-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

◆ ⇒ "2.1 Exploded view - exhaust gas temperature control", page 290

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Note

Coat threads of temperature sender with high-temperature paste ⇒ Electronic parts catalogue .

3 Exhaust gas recirculation system - vehicles with engine codes CBAA, CBAB, CBBB

Overview

- ⇒ “3.1 Diagram of vacuum connections”, page 297
- ⇒ “3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 297
- ⇒ “3.3 Removing and installing exhaust gas recirculation valve N18 with exhaust gas recirculation potentiometer G212 ”, page 299
- ⇒ “3.4 Checking exhaust gas recirculation cooler change-over”, page 301
- ⇒ “3.5 Removing and installing exhaust gas recirculation cooler”, page 302
- ⇒ “3.6 Checking exhaust gas recirculation cooler for leaks”, page 305

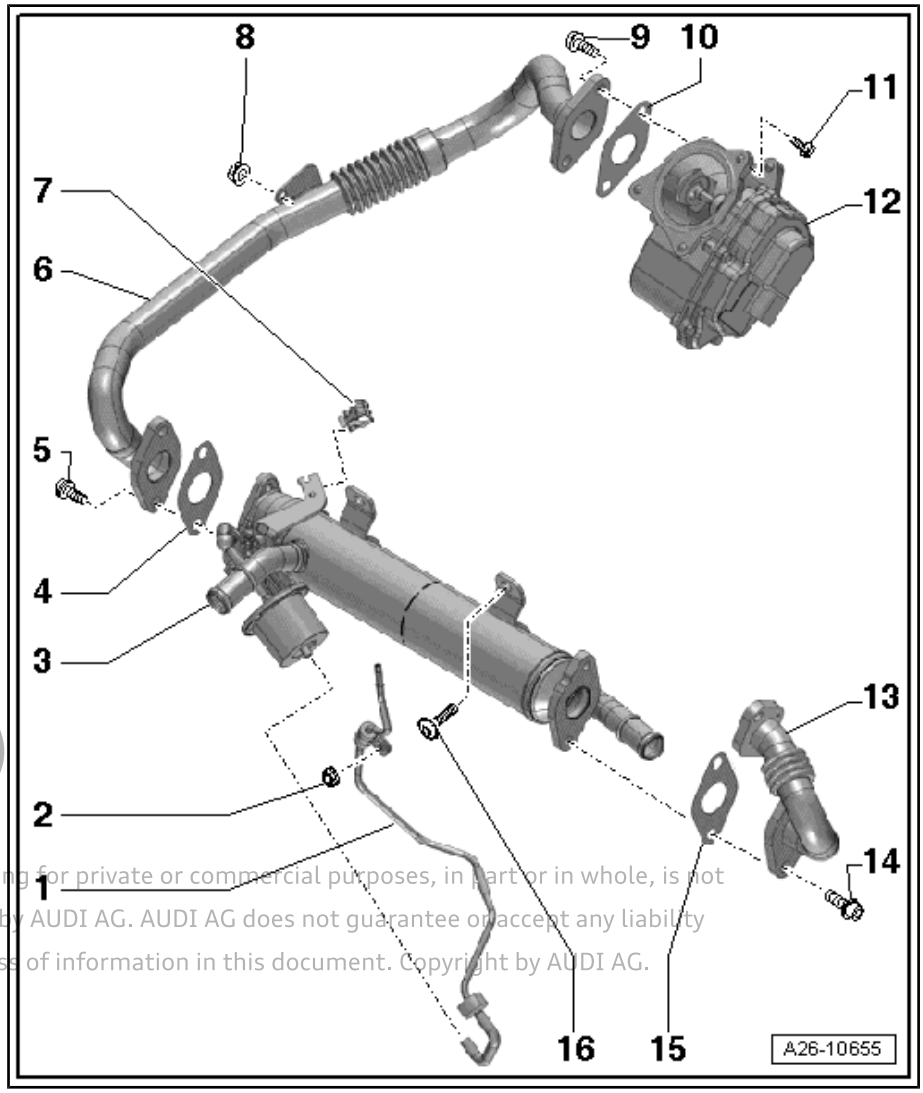
3.1 Diagram of vacuum connections

⇒ “1.1 Diagram of vacuum connections”, page 237

3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler



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1 - Vacuum line
- ❑ Do not alter shape

2 - Nut
- ❑ 9 Nm

3 - Exhaust gas recirculation cooler
- ❑ Checking change-over function ⇒ page 301
- ❑ Removing and installing ⇒ page 302

4 - Gasket
- ❑ Renew

5 - Bolt
- ❑ 20 Nm

6 - Exhaust gas recirculation pipe
- ❑ With flexible joint; do not bend joint - risk of cracking

7 - Clip

8 - Nut
- ❑ 9 Nm

9 - Bolt
- ❑ 20 Nm

10 - Gasket
- ❑ Renew

11 - Bolt
- ❑ 9 Nm

12 - Exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-
- ❑ Removing and installing ⇒ page 299
- ❑ Adaption must be performed after renewing exhaust gas recirculation valve - N18- : allow engine to run for 1 minute, switch off engine and switch off ignition for 5 minutes

13 - Exhaust gas recirculation pipe

14 - Bolt
- ❑ 20 Nm

15 - Gasket
- ❑ Renew

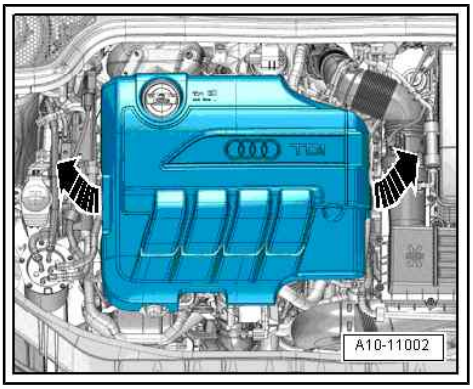
16 - Bolt
- ❑ 9 Nm

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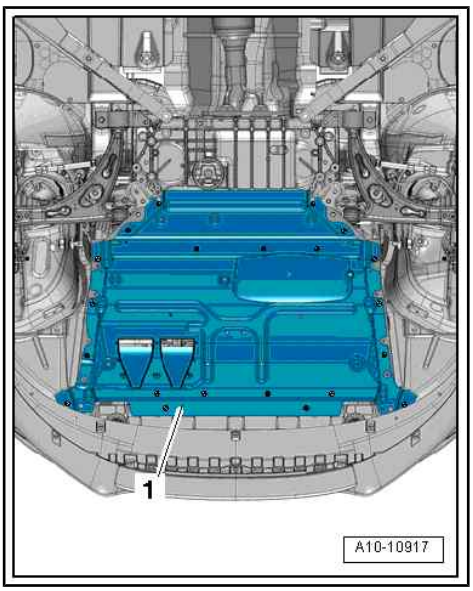
3.3 Removing and installing exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212-

Removing

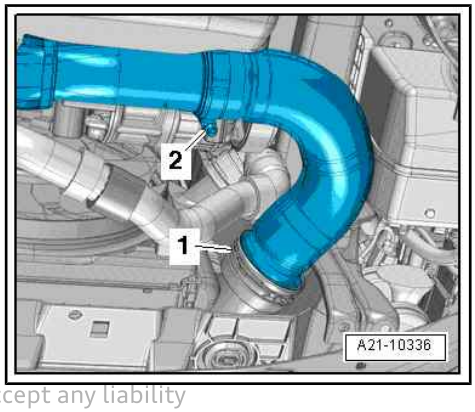
– Remove engine cover panel -arrows-.



– Remove noise insulation -1- ⇒ Rep. gr. 50 .

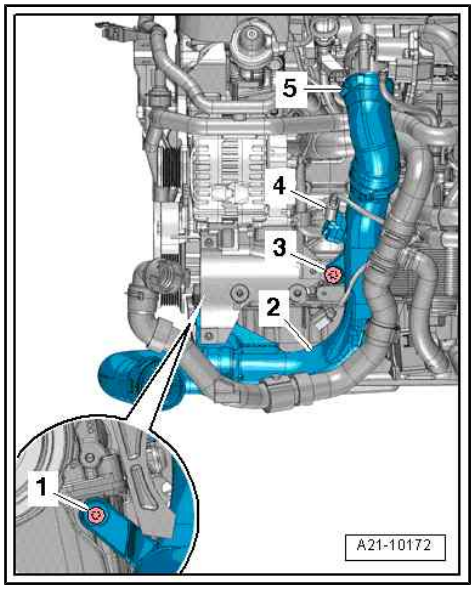


– Release hose clip -2-, lift retaining clip -1- and remove air hose.



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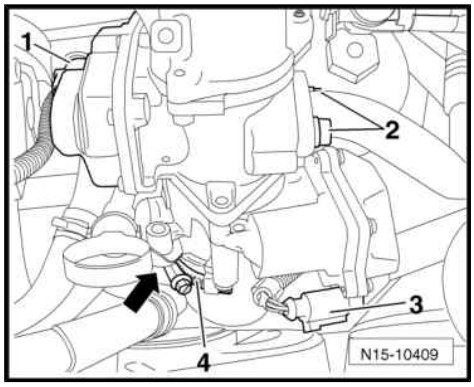
– Remove bolts -1- and -3-.
– Loosen hose clip -5- and disconnect air pipe -2-, but leave in position.



Note

Disregard -item 4-.

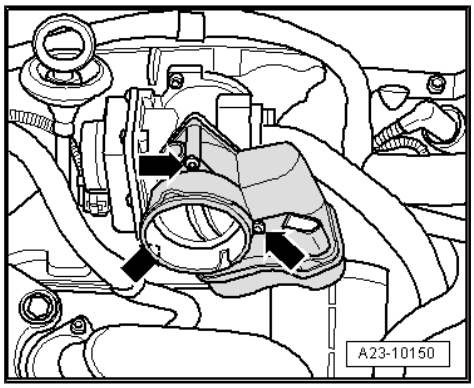
– Unplug electrical connector -3- at intake manifold flap motor - V157- .



Note

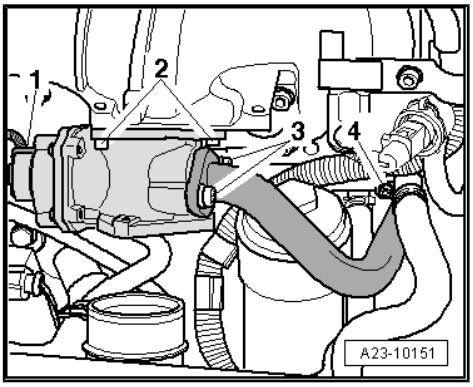
Disregard -items 1, 2, 4- and -arrow-.

– Unscrew bolts -arrows- and detach intake manifold flap motor - V157- .



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– Unplug electrical connector -1- on exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212- .
– Remove bolts -2- and -3- and detach exhaust gas recirculation valve - N18- with exhaust gas recirculation potentiometer - G212- .



Note

Disregard -item 4-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 297

Note

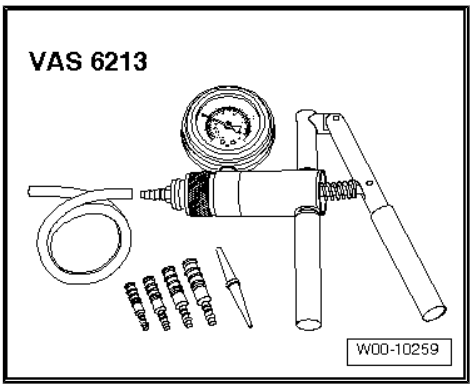
Renew O-ring.

– Install intake manifold flap motor - V157- ⇒ Rep. gr. 23 .
– Install air pipe ⇒ page 268 .
– Install air hose with plug-in connector ⇒ page 270 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Adaption must be performed after renewing exhaust gas re-circulation valve - N18- : allow engine to run for 1 minute, switch off engine and switch off ignition for 5 minutes.

3.4 Checking exhaust gas recirculation cooler change-over

Special tools and workshop equipment required

♦ Hand vacuum pump - VAS 6213-



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Procedure

– Detach heat shield sleeve.

– Disconnect vacuum hose from vacuum unit and connect hand vacuum pump - VAS 6213- in its place.

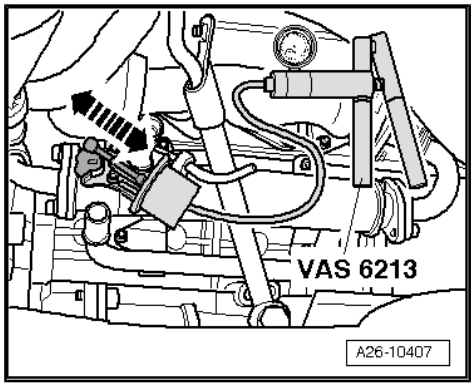
– Operate hand vacuum pump to produce a vacuum.

• The linkage of the exhaust gas recirculation cooler change-over should move -arrows-.

If the linkage does not move or only moves jerkily:

♦ The vacuum unit is defective.

♦ The change-over flap for exhaust gas recirculation is sticking.



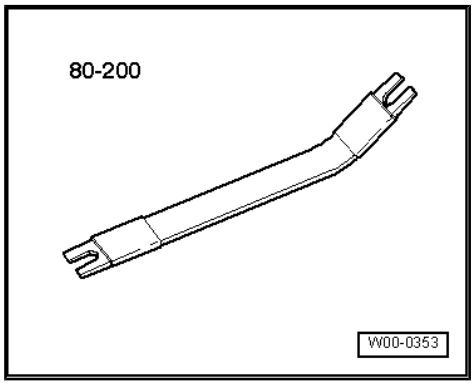
Note

Secure the heat insulation sleeve in the original position when installing.

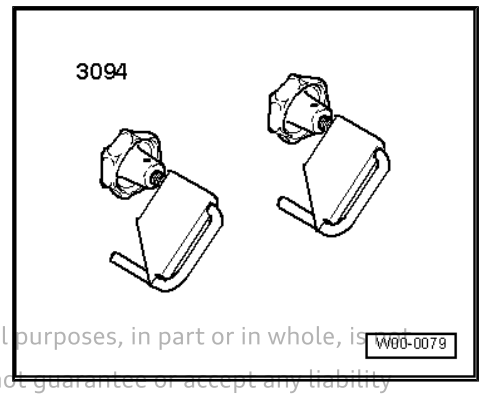
3.5 Removing and installing exhaust gas re-circulation cooler

Special tools and workshop equipment required

♦ Removal lever - 80 - 200-

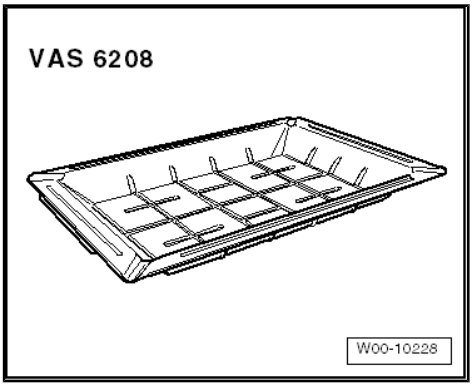


♦ Hose clamps up to 25 mm - 3094-

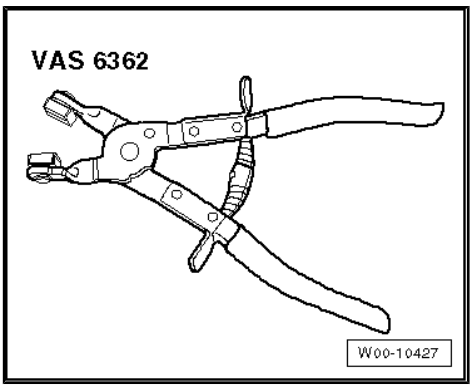


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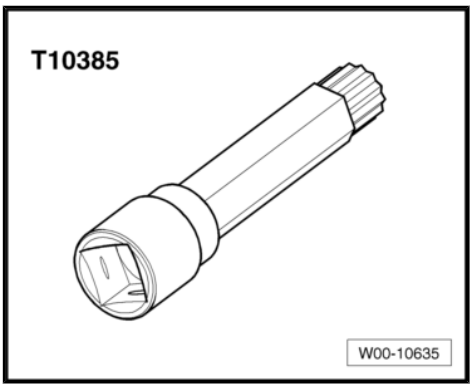
♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6362-



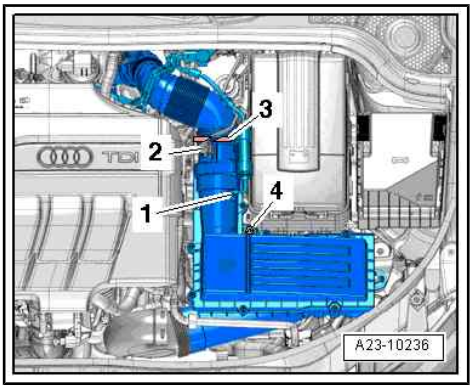
♦ Bit XZN 10 - T10385-



Removing

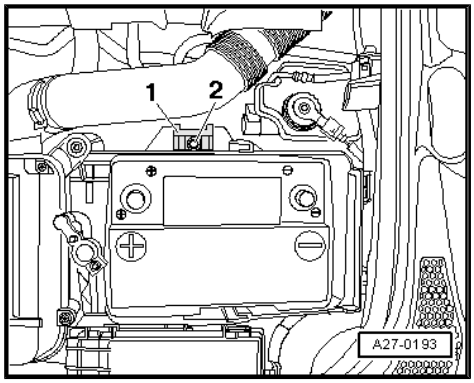
– Remove particulate filter ⇒ page 279 .

– Remove air cleaner housing ⇒ Rep. gr. 23 .

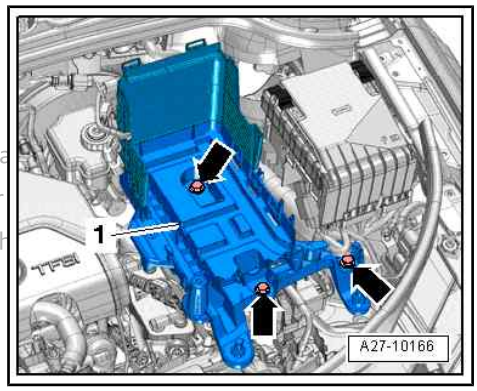


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– Remove battery ⇒ Electrical system; Rep. gr. 27 .

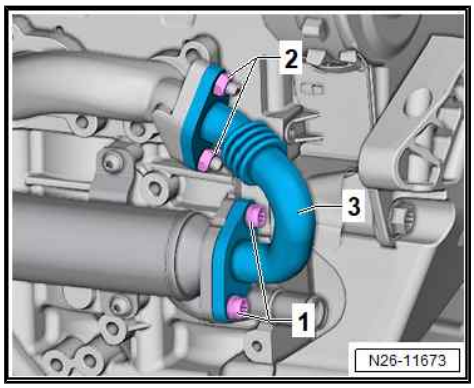


– Remove bolts -arrows- and take out battery tray -1-.

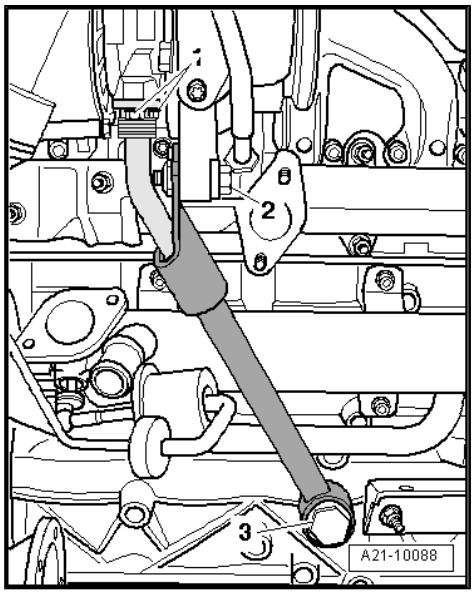


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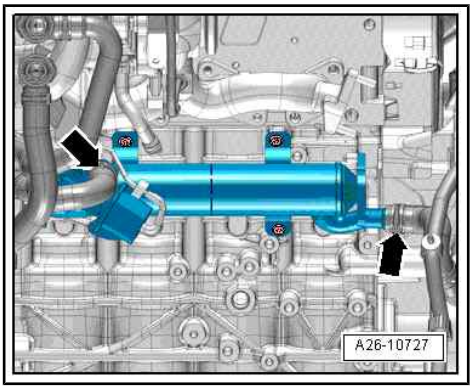
– Remove bolts -1- and nuts -2-.
– Detach exhaust gas recirculation pipe -3-.
– Place drip tray for workshop hoist - VAS 6208- beneath engine.



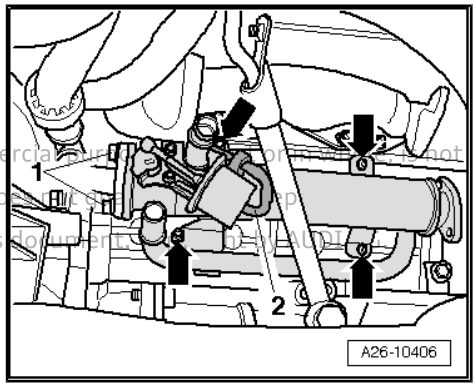
– Remove bolts -1, 2- and banjo bolt -3-.
– Detach support for turbocharger with oil return pipe.



– Clamp off coolant hoses using hose clamps -3094- , release hose clips -arrows- and disconnect coolant hoses from exhaust gas recirculation cooler.
– Detach heat insulation sleeve from vacuum unit.



– Unscrew bolts -1- for exhaust gas recirculation pipe using bit XZN 10 - T10385- .
– Disconnect vacuum hose -2- from vacuum unit and move clear.
– Remove bolts -arrows- and detach exhaust gas recirculation cooler.



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Installing

Installation is carried out in reverse order; note the following:

Tightening torque

♦ ⇒ “3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 297

Note

♦ *Renew gaskets, seals and self-locking nuts.*
♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
♦ *Fit heat insulation sleeve in the original position when installing.*

– Install support for turbocharger ⇒ page 239 .
– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install particulate filter ⇒ page 279 .
– Check coolant level ⇒ page 204 .

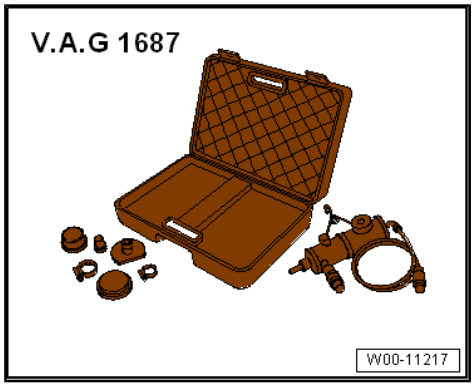
3.6 Checking exhaust gas recirculation cooler for leaks

Note

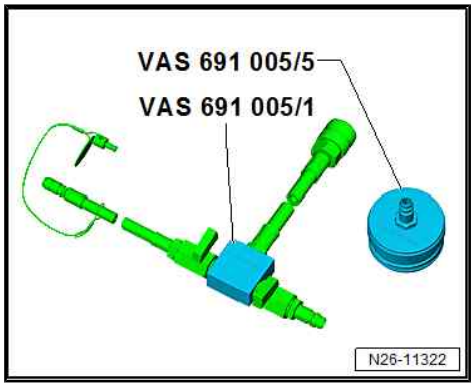
A pressure of 0.8 bar is applied to the exhaust gas recirculation cooler on the exhaust side in order to measure the pressure in the cooling system.

Special tools and workshop equipment required

- Charge air system tester - V.A.G 1687-

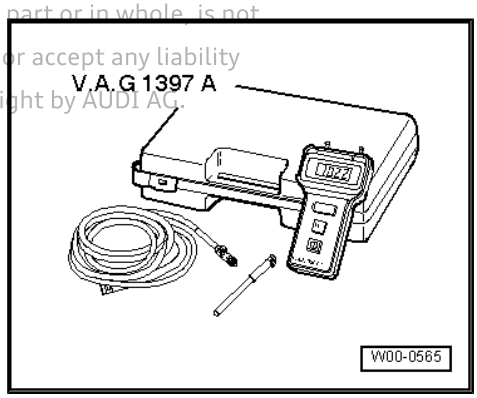


- Adapter - V.A.G 1687/11-
- Adapter - V.A.G 1687/15- for exhaust pipes with 60 mm and 65 mm diameter
- Adapter - V.A.G 1687/16- for exhaust pipe with 55 mm diameter
- Y-connector - VAS 691 005/1-



- Test instrument adapter - VAS 691 005/5-
- Turbocharger tester - V.A.G 1397A-

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Test condition:

- Coolant temperature must be at least 40°C.

Connecting turbocharger tester - V.A.G 1397A- :

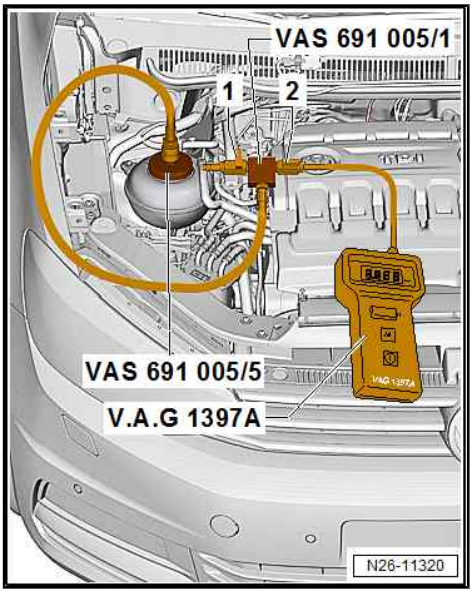
– Fit test adapter - VAS 691 005/5- onto coolant expansion tank.

– Fit Y-connector - VAS 691 005/1- onto test adapter - VAS 691 005/5- .

– Close valve -1- for connection »C« and open valve -2- for connection »A«.

– Attach hose from connection »A« on Y-connector to connection »II« on turbocharger tester - V.A.G 1397A- .

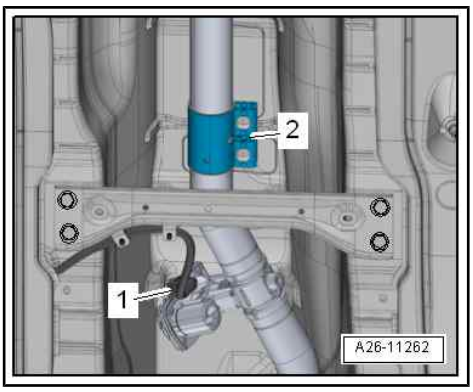
– Set turbocharger tester - V.A.G 1397A- to switch position »II« (relative pressure measurement) and switch it on. The »II« must be visible.



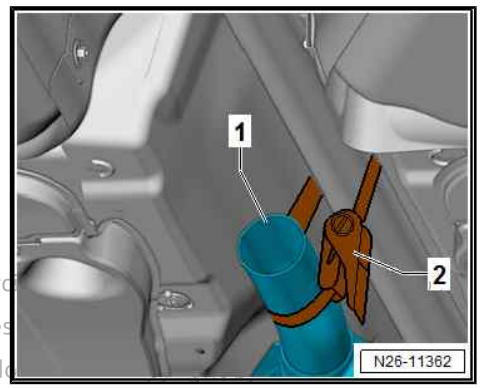
Connecting tester - V.A.G 1687- :

– If fitted, unclip wire leading to exhaust flap control unit -1-.

– Loosen clamp -2- on exhaust pipe and push to rear.



– On vehicles without tunnel cross-piece, exhaust pipe -1- must be tied up with a tensioning strap -2-.



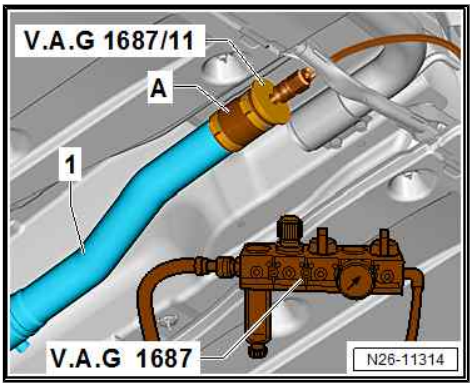
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– Connect adapter - V.A.G 1687/11- with hose -A- to exhaust pipe (engine end). Secure hose with hose clips.

Hose -A- for exhaust pipes with 55 mm diameter: Use hose - V.A.G 1687/16- .

Hose -A- for exhaust pipes with 60 mm or 65 mm diameter: Use hose - V.A.G 1687/15- .

– Connect charge air system tester - V.A.G 1687- to adapter - V.A.G 1687/11- .

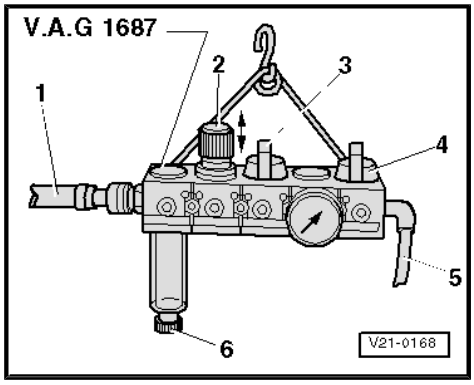


Prepare charge air system tester - V.A.G 1687- as follows:

– Unscrew pressure control valve -2- completely and close valves -3- and -4-.

• Make sure knob is pulled out before turning pressure control valve -2-.

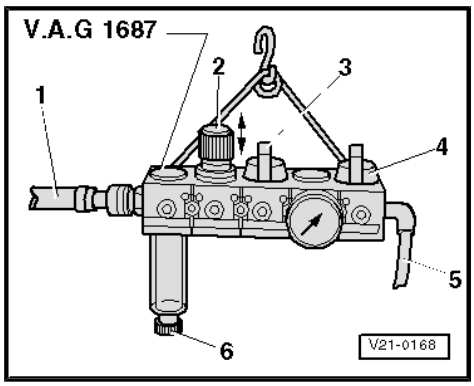
– Connect charge air system tester - V.A.G 1687- to compressed air hose -1-.



– Open valve -3-.

– Adjust pressure to 0.8 bar via pressure control valve -2-.

– Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.8 bar again.



Note

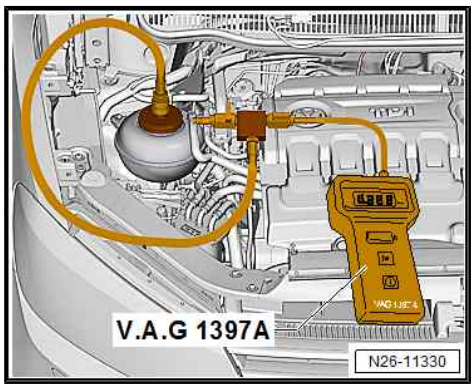
A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.

Reading off values from turbocharger tester - V.A.G 1397A- :

• Observe turbocharger tester for approx. 5 minutes.

• The pressure indicated on the turbocharger tester must not exceed 0.025 bar.

– If the pressure on the turbocharger tester exceeds 0.025 bar, compressed air is escaping from the exhaust side into the cooling system. The exhaust gas recirculation cooler is leaking. Renew exhaust gas recirculation cooler.

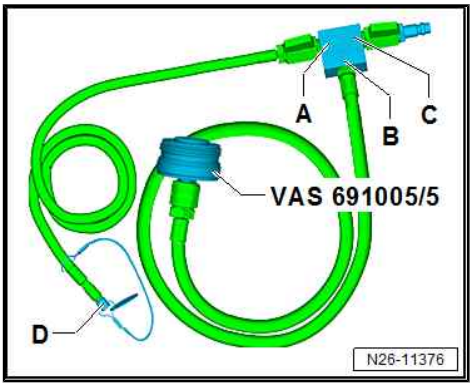


Note

When coolant cools down, a vacuum may build up. A minus sign on the turbocharger tester indicates that a vacuum has formed. Values preceded by a »minus« symbol do not indicate a leak. If in doubt, equalise pressure in cooling system and perform test again.

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Cleaning Y-connector - VAS 691 005/1- :



Note

After the leak test has been completed, the Y-connector - VAS 691 005/1- must be cleaned to remove any water which may have entered.

- Insert cleaning nozzle -D- in hose from connection -A- on Y connector .
- Fit test adapter - VAS 691 005/5- onto hose from connection -B-.
- Fit compressed air hose on connection -C-.
- Open cut-off valves and blow through hose for approx. 15 seconds.

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4 Cleaning exhaust gas recirculation system - vehicles with engine codes CBAA, CBAB, CBBB

Explanation

Certain extreme driving modes (e.g. short distances) may result in varnish formation/carbon deposits inside the exhaust gas re-circulation cooler. In this case, the exhaust emissions warning lamp in the instrument cluster lights up and one of the following codes appears in the event memory:

- P401 EGR system throughput too low

In most cases, these carbon deposits can be removed by carrying out the rinsing/cleaning procedure described below
⇒ “4.1 Starting cleaning procedure for exhaust gas recirculation system”, page 310 .

4.1 Starting cleaning procedure for exhaust gas recirculation system

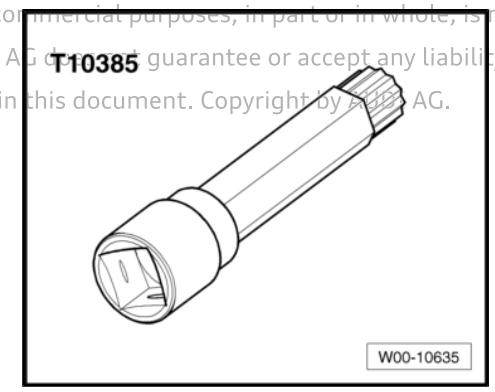
Special tools and workshop equipment required

- Cooler rinsing system for exhaust gas recirculation - VAS 542 007-



- Adapter kit - VAS 542 007/4- (2x)
- Bit XZN 10 - T10385-

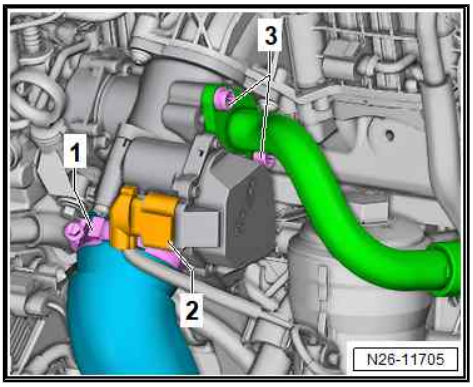
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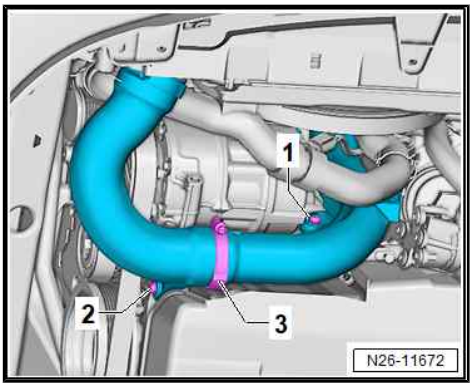
- M8 nut (2x)
- Ultrasonic cleaning unit - VAS 6418-

– Remove engine cover panel.

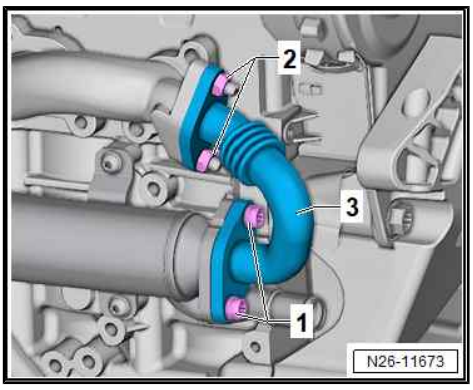
– Release clamp -1-, unplug connector -2- and unscrew bolts -3-.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Noise insulation .



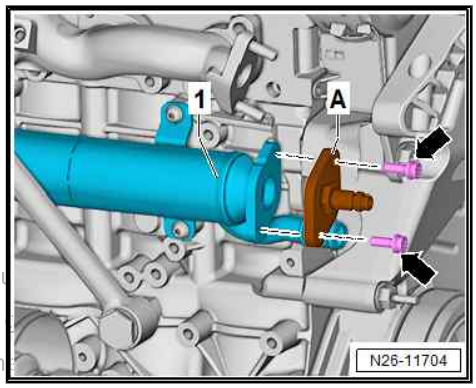
– Remove bolt -1- and, if fitted, bolt -2-.
– Open clamp -3- and disconnect hose.
– Carefully pull charge air pipe downwards as far as possible. Pay attention to electrical wiring.



– Remove bolts -1- and nuts -2-.
– Detach connecting pipe -3-.

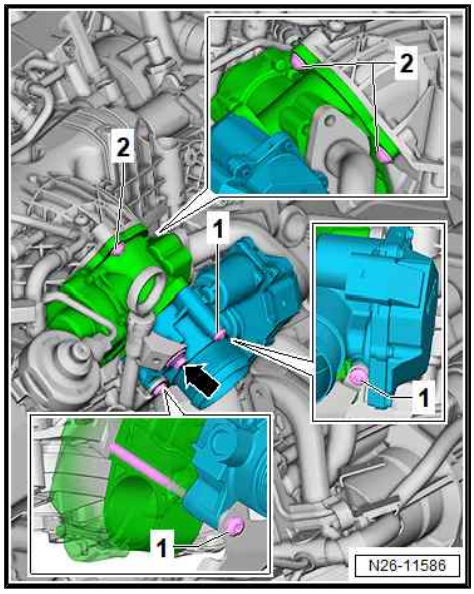


– Fit adapter - VAS 542 007/4-2- -A- onto opening on exhaust gas recirculation cooler -1-.
– Screw in original bolts -arrows- from connecting pipe and hand-tighten. Ensure that seal on adapter is not pinched.
– Connect supply hose - VAS 542 007/2-2- of cleaning unit to adapter on exhaust gas recirculation cooler.



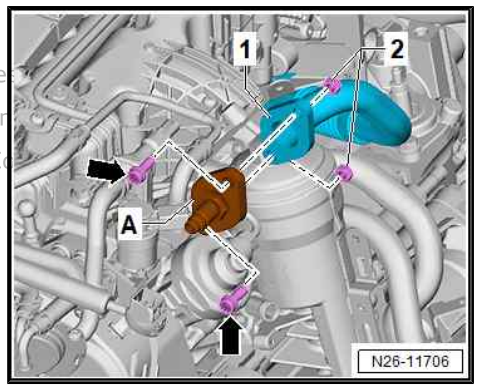
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– Remove bolt -arrow- from oil dipstick retainer and bolts -1-, and detach throttle valve module.
– Remove bolts -2- and detach exhaust gas recirculation valve; unplug connector from exhaust gas recirculation valve when doing so.



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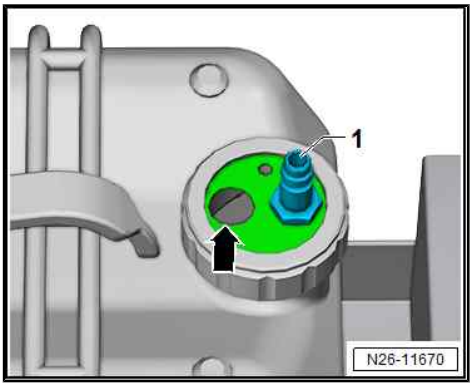
– Fit adapter - VAS 542 007/4-2- -A- onto opening on connecting pipe -1-.
– Screw in original bolts -arrows- from connecting pipe and hand-tighten M8 nuts -2-. Ensure that seal on adapter is not pinched.
– Connect return hose - VAS 542 007/2-3- of cleaning unit to adapter -A- on connecting pipe.
– Connect battery charger to vehicle battery.
– Connect battery clamps of pump - VAS 542 007/3- to vehicle battery.



Preparing cooler rinsing system for exhaust gas recirculation - VAS 542 007-

– Fill canister - VAS 542 007/1- with 9 litres of warm (approx. 40 °C – 50° C) tap water.
– Pour 1 litre of cleaning solution - D 600 200 A2- into canister.

– Connect intake hose - VAS 542 007/2-1- of pump to connection -1- on canister lid.
– Insert open end of return hose - VAS 542 007/2-3- into opening -arrow- on canister lid to approx half height of canister.



Note

Ensure that the relief valve tap on the supply hose is closed.

– Clean exhaust gas recirculation valve and connecting pipe while cleaning procedure is under way
⇒ “4.1.1 Cleaning exhaust gas recirculation valve N18 and connecting pipe”, page 315 .
– Operate pump - VAS 542 007/3- as follows:

Pump - VAS 542 007/3-	Time	Action
Switch on	25 minutes	Cleaning
Switch off	10 minutes	Cleaning solution taking effect
Switch on	25 minutes	Cleaning
Switch off	---	End of cleaning procedure

– Disconnect intake hose from canister and leave pump switched on until no more cleaning solution is extracted (empty the system).
– Pull return hose out of canister (cleaning solution may come out).
– Empty canister (observe country-specific requirements for disposal).
– Fill canister with 10 litres of warm (approx. 40 °C – 50 °C) tap water.
– Connect intake hose - VAS 542 007/2-1- of pump to connection on canister lid.
– Guide return hose - VAS 542 007/2-3- into a suitable container (minimum capacity of 12 litres) and fix in position.
– Switch on pump - VAS 542 007/3- and leave it on until the contents of the canister have fully flowed through the exhaust gas recirculation system.
– Release and detach supply hose - VAS 542 007/2-2- from adapter on exhaust gas recirculation cooler.
– Release and detach return hose - VAS 542 007/2-3- from adapter on connecting pipe.

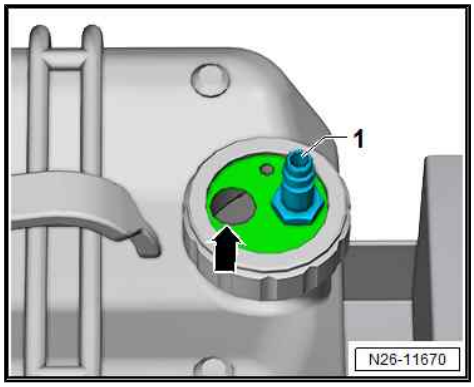
Note

Remaining water is blown out in the opposite direction to the direction for rinsing.

– Now connect return hose - VAS 542 007/2-3- to adapter on exhaust gas recirculation cooler.
– Connect compressed air adapter - VAS 542 007/5- to adapter on connecting pipe.

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– Insert open end of return hose - VAS 542 007/2-3- into opening -arrow- on canister lid to approx half height of canister.
– Intake hose - VAS 542 007/2-1- of pump must be connected to connection -1- on canister lid.
– Connect compressed air line to compressed air adapter - VAS 542 007/5- and blow all remaining water out of exhaust gas recirculation system.

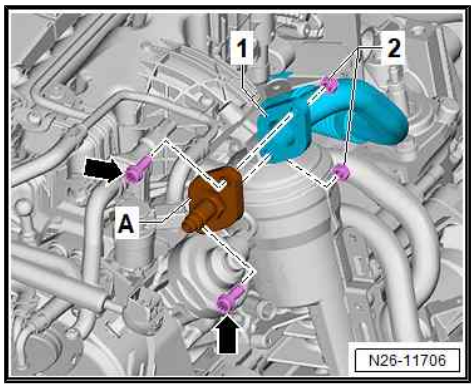


Caution

All water must be removed from the exhaust gas recirculation system. Otherwise the engine could be damaged.

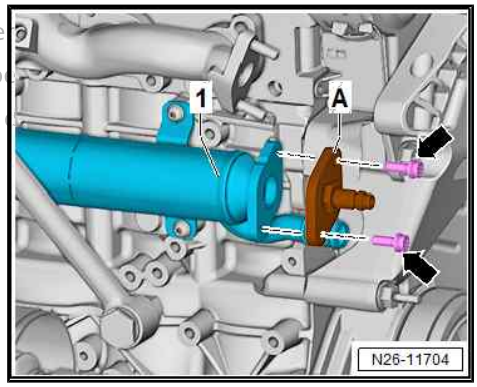
– Release and unplug compressed air adapter - VAS 542 007/5- .

– Remove adapter -A- from connecting pipe.

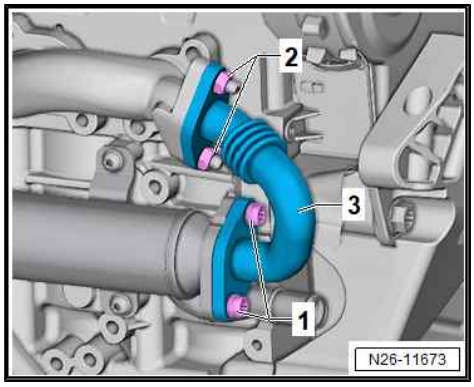


– Remove adapter -A- from exhaust gas recirculation cooler.

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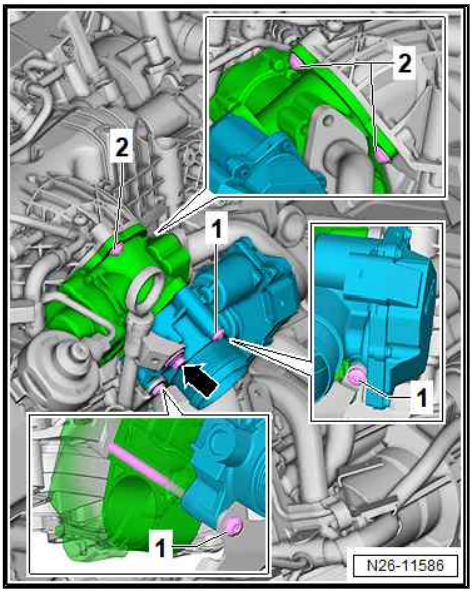


– Attach connecting pipe with new gaskets using new bolts -1- and nuts -2-.



– Install exhaust gas recirculation valve ⇒ “3.3 Removing and installing exhaust gas recirculation valve N18 with exhaust gas recirculation potentiometer G212 ”, page 299 .

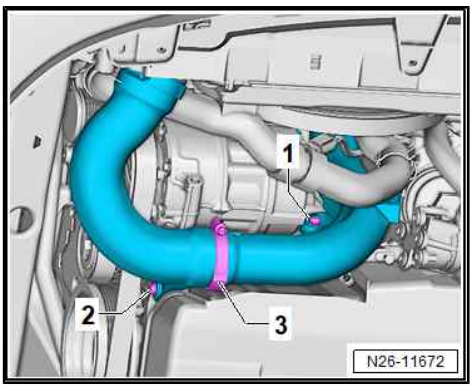
– Push charge air pipe upwards onto connection for throttle valve module.



– Screw in bolts -1- and -2- and tighten to 9 Nm.

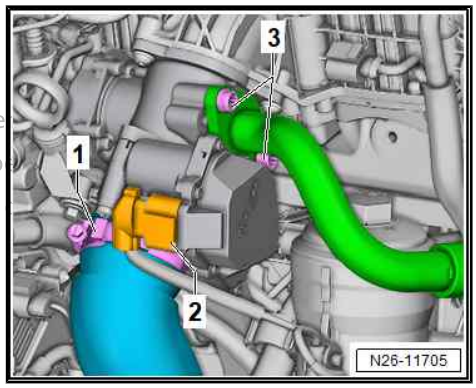
– Fit hose, position clamp -3- and tighten to 8 Nm.

– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 50 ; Noise insulation .



– Position clamp -1- and tighten to 8 Nm, and plug in connector -2-.

– Install connecting pipe with new gasket ⇒ “3.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 297 .



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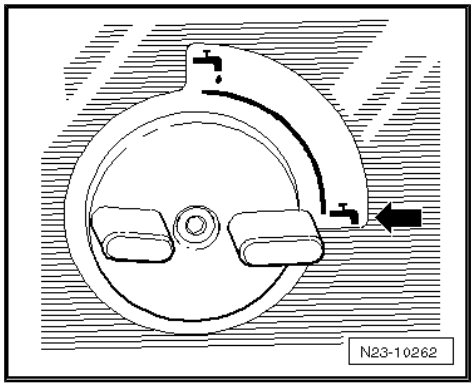
4.1.1 Cleaning exhaust gas recirculation valve - N18- and connecting pipe

Special tools and workshop equipment required

- Ultrasonic cleaning unit - VAS 6418-
- Cleaning solution - D 600 200 A2-
- Scraper set - VAS 6845-

– Remove coarse and solid dirt from valve stem and head using wooden or plastic scraper, e.g. from scraper set - VAS 6845- .

– Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).

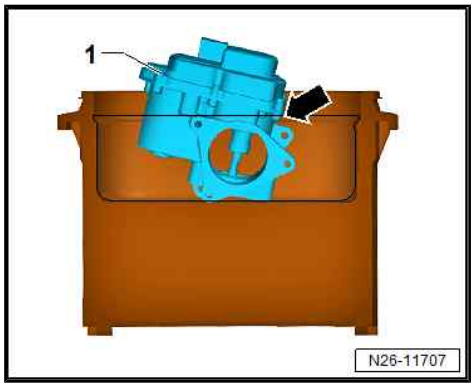


Note

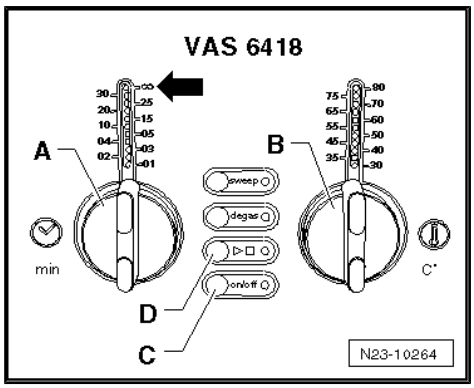
The ultrasonic bath can be heated up more quickly by using warm tap water.

– Fill ultrasonic cleaning unit - VAS 6418- with 1,800 ml of tap water and 200 ml of cleaning solution - D 600 200 A2- .

– Place exhaust gas recirculation valve and connecting pipe in cleaning unit, taking care to ensure that the electronics of the exhaust gas recirculation valve -arrow- are not submerged in the cleaning solution.



– Switch on cleaning unit by pressing on/off button -C-.
– Turn rotary temperature control -B- until LED for heating temperature is at 40 °C.
– Set rotary control for operating time -A- to -10-.
– Press ▶ -D- for longer than 2 seconds to start operation of unit.



Note

The temperature-controlled cleaning process is now started. While the fluid is being heated, the ultrasound is activated at intervals in order to circulate the cleaning solution. The ultrasound is activated continuously when the preselected temperature is reached. The actual cleaning process commences when the temperature reaches at least 40 °C and must last for at least 10 minutes.

– After cleaning successfully, rinse connecting pipe with clean water and blow out with compressed air.
– Rinse exhaust gas recirculation valve with clean water (only in area of valve stem and head).

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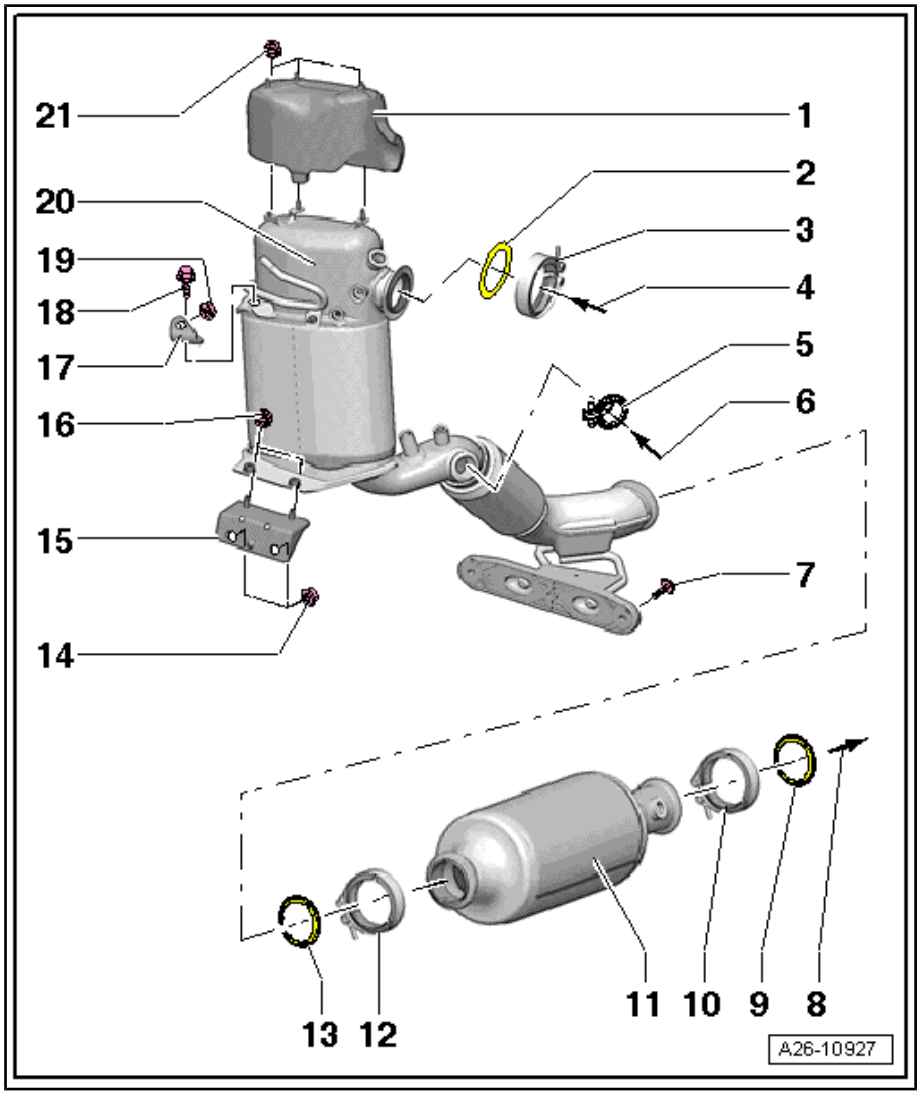
5 Silencer - vehicles with engine code CBEA

Overview

- ⇒ “5.1 Exploded view - particulate filter and NOx storage catalytic converter”, page 317
- ⇒ “5.2 Exhaust flap control unit J883 with trap catalytic converter - exploded view”, page 320
- ⇒ “5.3 Exploded view - centre silencer”, page 321
- ⇒ “5.4 Installation position of clamps on exhaust system”, page 321
- ⇒ “5.5 Wire routing on exhaust system components”, page 322
- ⇒ “5.6 Removing and installing particulate filter”, page 324
- ⇒ “5.7 Removing and installing NOx storage catalytic converter”, page 330
- ⇒ “5.8 Removing and installing exhaust flap control unit J883”, page 331
- ⇒ “5.9 Removing and installing trap catalytic converter”, page 331
- ⇒ “5.10 Removing and installing centre silencer”, page 332
- ⇒ “5.11 Stress-free alignment of exhaust system”, page 332
- ⇒ “5.12 Aligning tailpipe”, page 332
- ⇒ “5.13 Checking exhaust system for leaks”, page 332

5.1 Exploded view - particulate filter and NOx storage catalytic converter

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1 - Heat shield

2 - Seal

- ❑ Renew

3 - Clip

- ❑ 7 Nm
- ❑ Renew
- ❑ Note installation position ⇒ page 321

4 - From turbocharger

5 - Clamp

- ❑ 3.5 Nm
- ❑ Renew
- ❑ Note installation position ⇒ page 321

6 - From exhaust gas recirculation filter

7 - Bolt

- ❑ 23 Nm

8 - To exhaust flap control unit - J883-

9 - Seal

- ❑ Renew
- ❑ Note installation position ⇒ page 320

10 - Clamp

- ❑ 7 Nm
- ❑ Renew
- ❑ Note installation position ⇒ page 321

11 - NOx storage catalytic converter

- ❑ Reset learnt values after renewing ⇒ Vehicle diagnostic tester, `01 - Engine electronics, functions`, `01 - Reset learnt values`
- ❑ Removing and installing ⇒ page 330

12 - Clamp

- ❑ 7 Nm
- ❑ Renew
- ❑ Note installation position ⇒ page 321

13 - Seal

- ❑ Renew

14 - Nut

- ❑ 23 Nm

15 - Bracket (bottom)

- ❑ For particulate filter

16 - Nut

- ❑ 23 Nm

17 - Bracket (top)

- ❑ For particulate filter

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18 - Bolt

- ❑ 23 Nm

19 - Nut

- ❑ 23 Nm

20 - Particulate filter with catalytic converter

Caution

Avoid damage to flexible joint after particulate filter. Notes on removal and installation:

Do not bend flexible joint more than 10°.

Install flexible joint so that it is not under tension.

Take care not to damage wire mesh on flexible joint.

Prevent flexible joint from bending by using transportation lock for flexible joint - T10404- .

- ❑ Removing and installing ⇒ page 324
- ❑ Adapt learnt values after renewing ⇒ Vehicle diagnostic tester, `01 - Engine electronics, functions`, `01 - Adapt particulate filter learnt values`

21 - Nuts

- ❑ 9 Nm

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5.2 Exhaust flap control unit - J883- with trap catalytic converter - exploded view

1 - NOx storage catalytic converter

- ❑ Removing and installing ⇒ page 330

2 - Seal

- ❑ Renew
- ❑ Note installation position ⇒ page 320

3 - Clamp

- ❑ 7 Nm
- ❑ Renew
- ❑ Installation position ⇒ page 321

4 - Exhaust flap control unit - J883-

- ❑ Removing and installing ⇒ page 331

5 - Trap catalytic converter

- ❑ Removing and installing ⇒ page 331

6 - Centre silencer

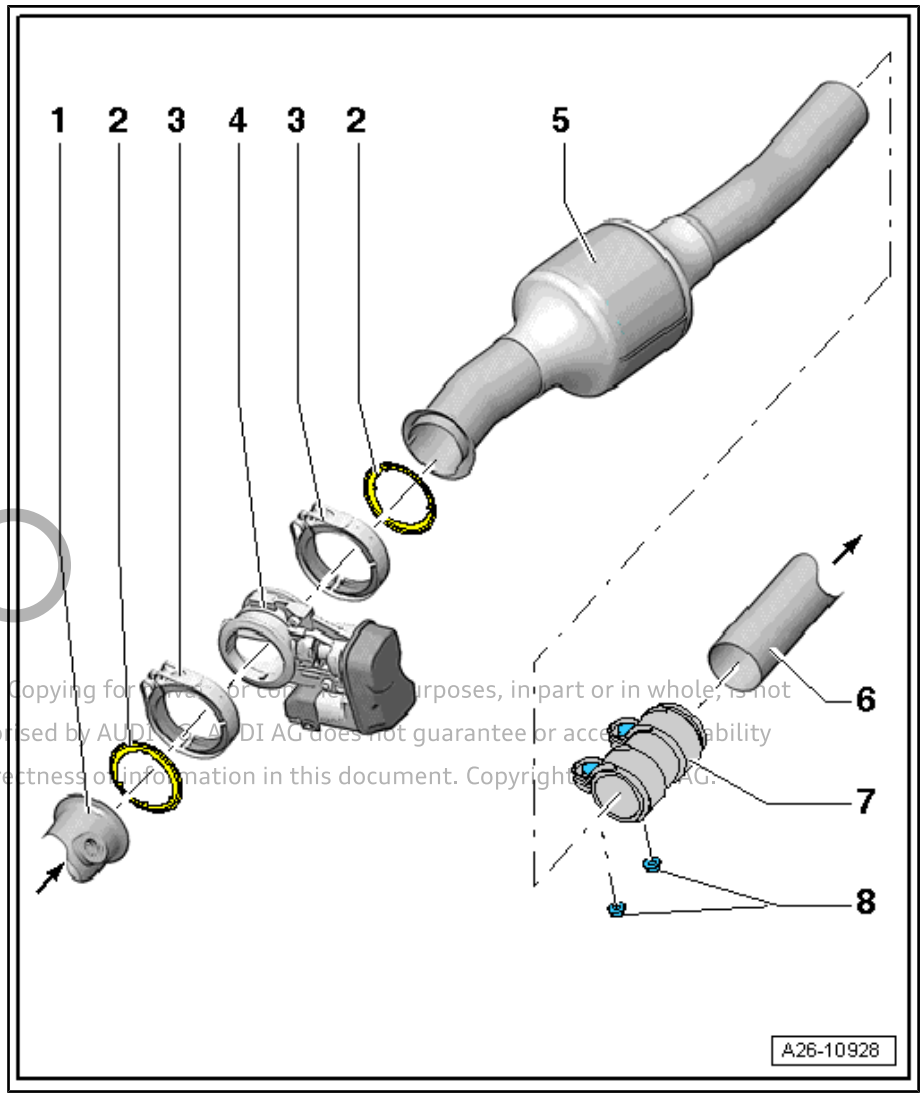
- ❑ Removing and installing ⇒ page 321

7 - Clamp

- ❑ Note installation position ⇒ page 321

8 - Nut

- ❑ 23 Nm

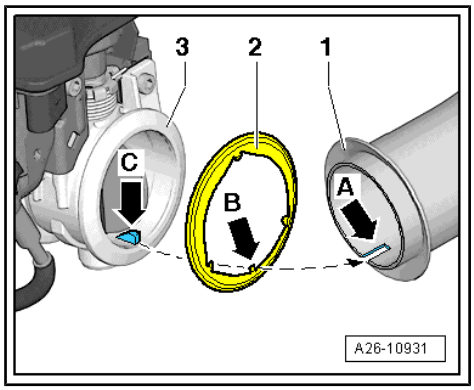


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Installation position of seal between exhaust flap control unit - J883- and NOx storage catalytic converter or trap catalytic converter:

– Fit square lug -B- on seal -2- into notch -A- of NOx storage catalytic converter or trap catalytic converter -1-.

– Fit retaining lug -C- on exhaust flap control unit -3- into notch -A-.



5.3 Exploded view - centre silencer

1 - Bolt
- ❑ 23 Nm

2 - Securing strap

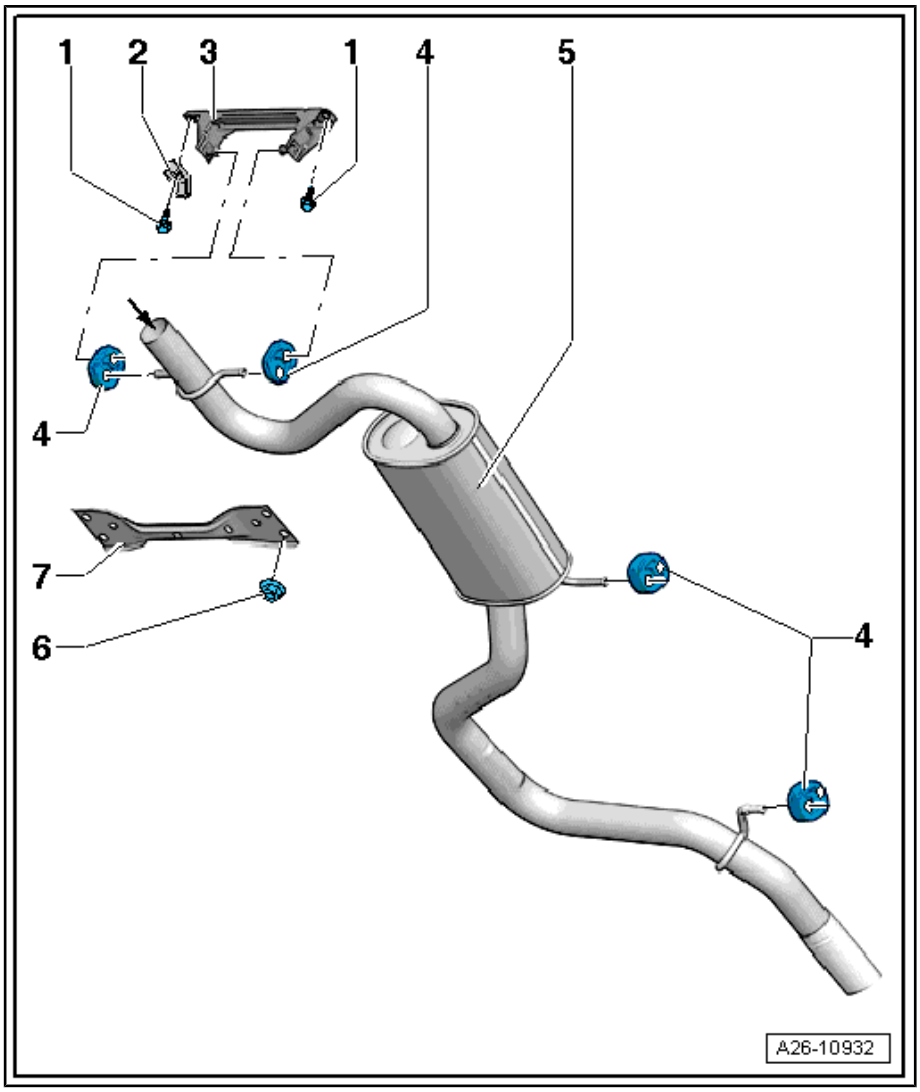
3 - Mounting
- ❑ Renew if damaged

4 - Rubber mounting
- ❑ Renew if damaged

5 - Centre silencer
- ❑ Removing and installing ⇒ page 321

6 - Nut
- ❑ 23 Nm

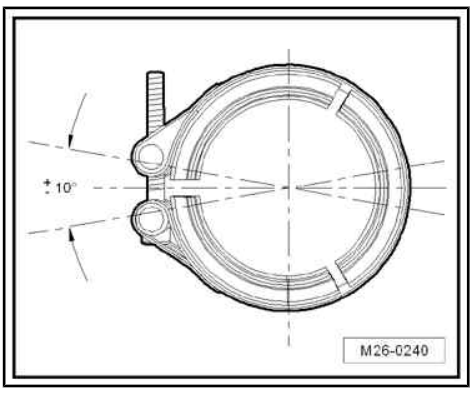
7 - Rear cross member



5.4 Installation position of clamps on exhaust system

Installation position of clamp between particulate filter and turbocharger

– Fit clamp with clamping bolt facing downwards and make sure that angle is correct: -± 10°-.



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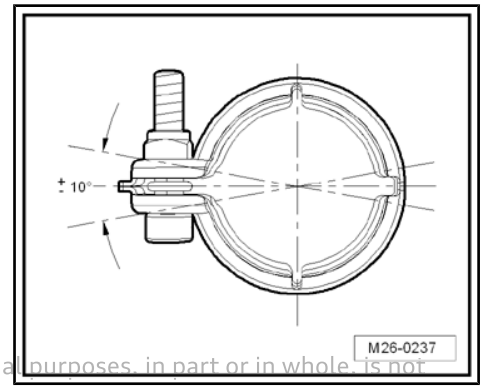
Installation position of clamp between particulate filter and exhaust gas recirculation filter.

– Fit clamp with clamping bolt facing downwards and make sure that angle is correct: -± 10°-.

– Install exhaust gas temperature sender and make sure that angles are correct.

1 - Exhaust gas temperature sender 3 - G495- : angle -23°-

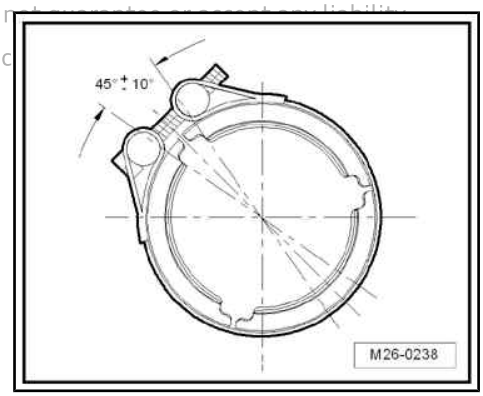
2 - Exhaust gas temperature sender 2 - G448- : angle -30°-



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Installation position of clamps between particulate filter and NOx storage catalytic converter, exhaust flap control unit - J883- and NOx storage catalytic converter or ammonia trap

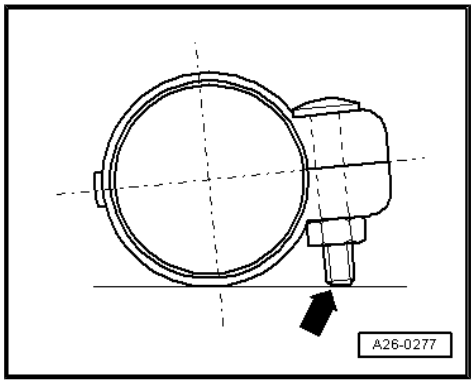
– Fit clamp making sure angle is correct: -45°± 10°-.



Installation position of clamp

– Install clamp so that the bolt end does not protrude beyond bottom of clamp -arrow-:

• Bolt connection faces to right.



5.5 Wire routing on exhaust system components

Wire routing on exhaust flap control unit

1 - Trap catalytic converter

2 - NOx storage catalytic converter

3 - Direction of travel

4 - Electrical connection

- ❑ Note installation position
- ❑ Check that it is securely seated

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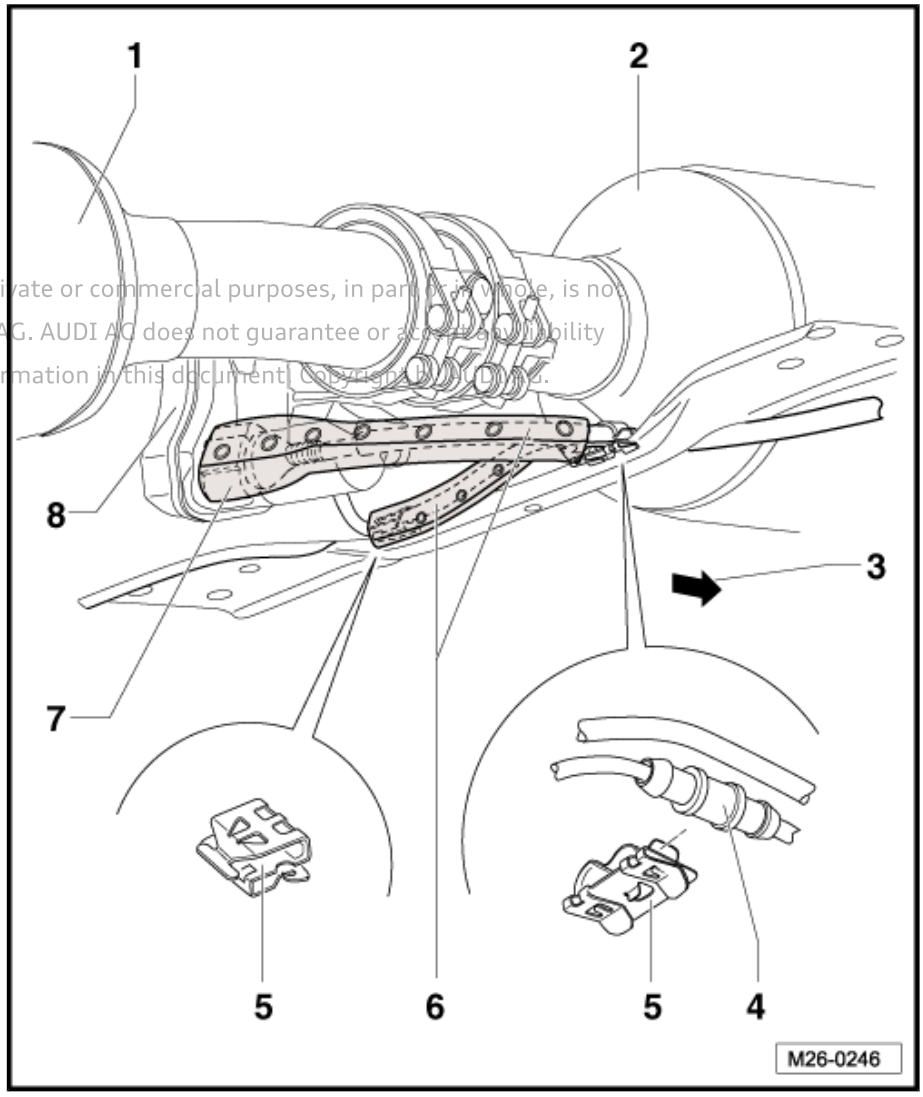
5 - Cable retainer

6 - Heat shield

- ❑ Note installation position
- ❑ Renew if damaged

7 - Connector for exhaust flap control unit - J883-

8 - Exhaust flap control unit - J883-



Wire routing between Lambda probe after catalytic converter - G130- and exhaust gas temperature sender 4 - G648-

1 - Lambda probe after catalytic converter - G130-

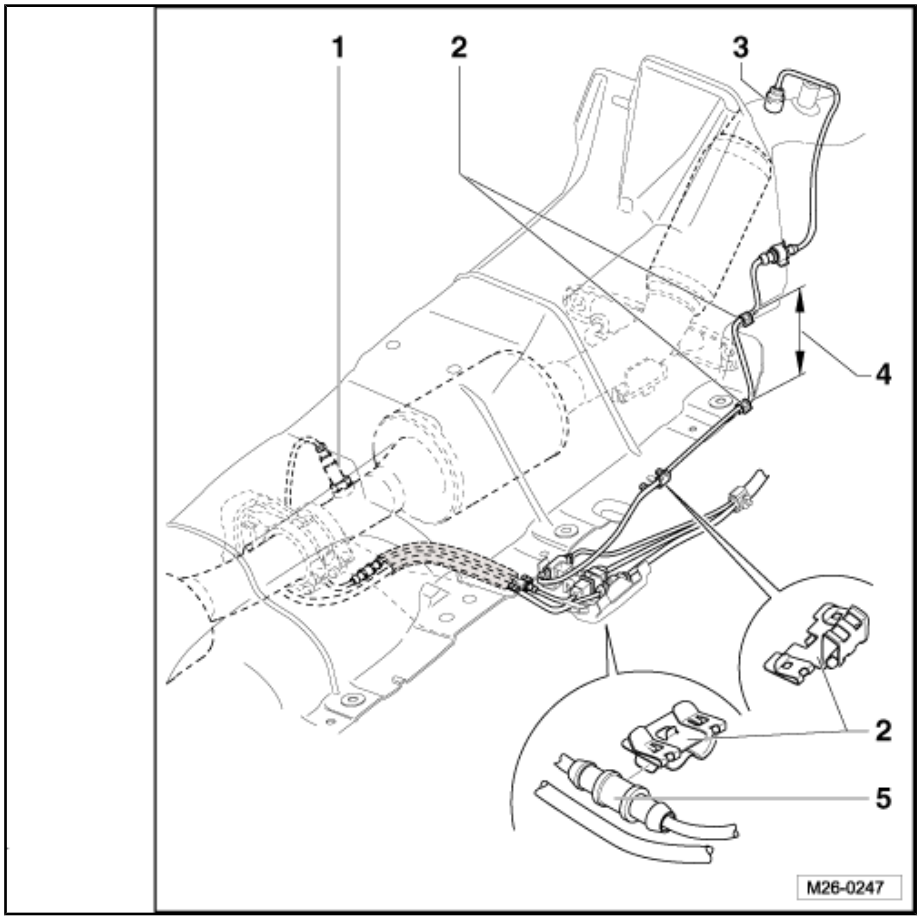
2 - Cable retainer

3 - Exhaust gas temperature sender 4 - G648-

4 - Gap: 100 mm

5 - Line

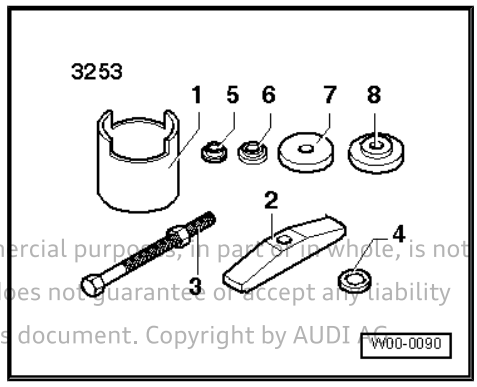
- ❑ Note installation position
- ❑ Check that it is securely seated



5.6 Removing and installing particulate filter

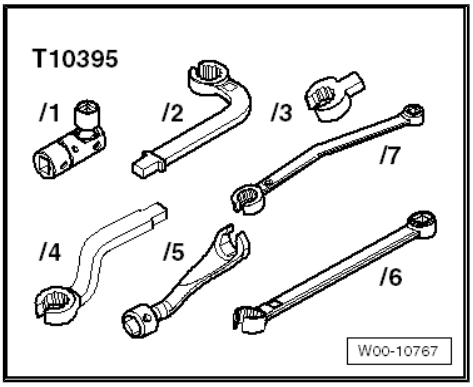
Special tools and workshop equipment required

- ♦ -3253/5- from assembly tool - 3253-



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♦ Tool set, 17 mm - T10395-



♦ Flange bolt M10x35

Removing

– Remove Lambda probe - G39- ⇒ Rep. gr. 23 .

– Remove pressure differential sender - G505- with control pipes ⇒ Rep. gr. 23 .

– Remove exhaust gas pressure sensor 1 - G450- ⇒ Rep. gr. 23 .

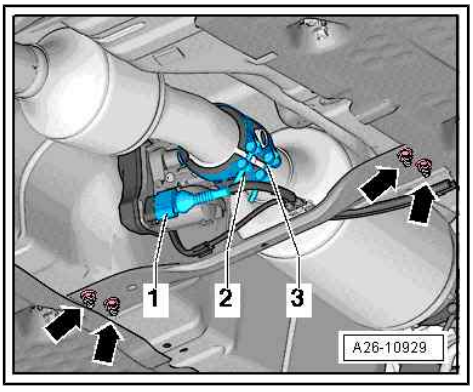
– Remove filter ⇒ page 345 .

– Remove exhaust gas temperature sender 2 - G448- ⇒ page 337 .

– Remove exhaust gas temperature sender 3 - G495- ⇒ page 338 .

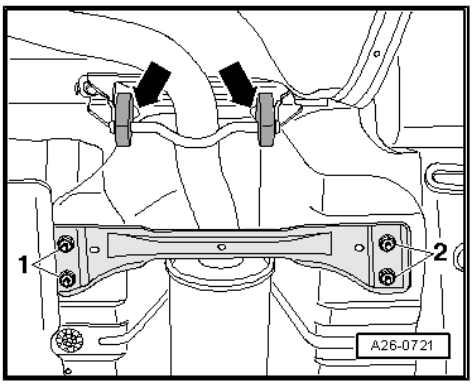
– Remove nuts -arrows- and detach front cross member on vehicle underside.

– Unplug connector -1-.



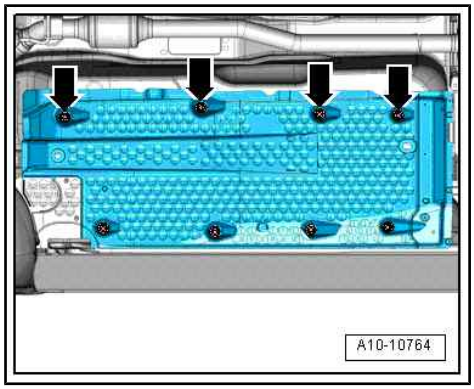
– Remove nuts -1- and -2- and detach rear cross member on vehicle underside.

– Remove centre silencer ⇒ page 332 .

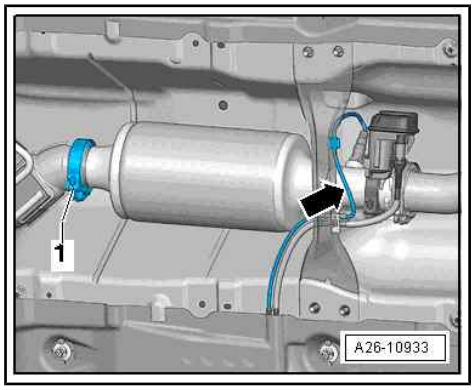


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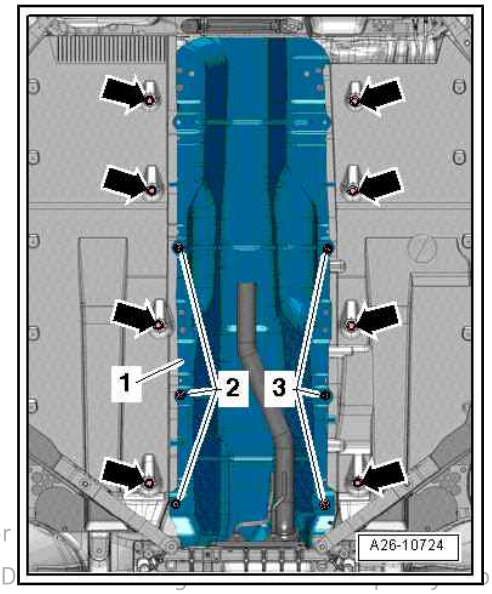
– Unscrew nuts -arrows- and pull underbody cover down slightly.



– Unplug electrical connector -2- and move wiring clear.
– Loosen clamp -1- and remove trap catalytic converter, exhaust flap control unit - J883- and NOx storage catalytic converter as one unit.

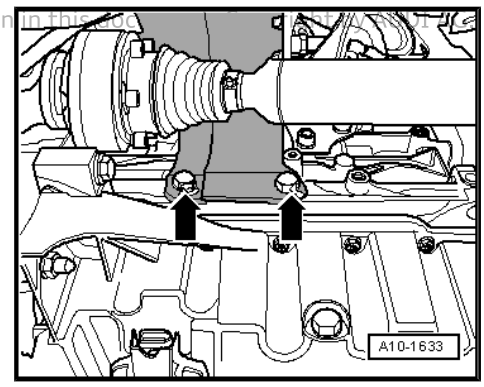


– Remove nuts -arrows-.
– Remove clamping washers -2- and -3-.
– Pull inner side of cover on vehicle underside down slightly until heat shield -1- for centre tunnel can be detached.
– Remove front right wheel.

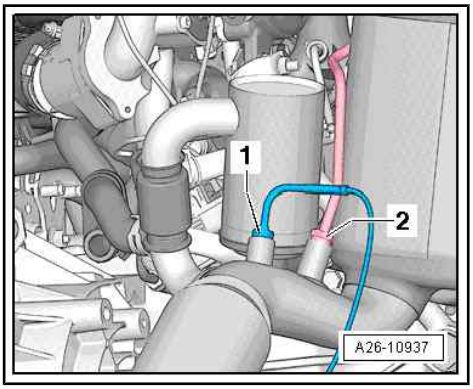


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without ... information in this ...

– Remove bolts -arrows- and detach heat shield for drive shaft (right-side).
– Unbolt drive shaft (right-side) from gearbox flange.



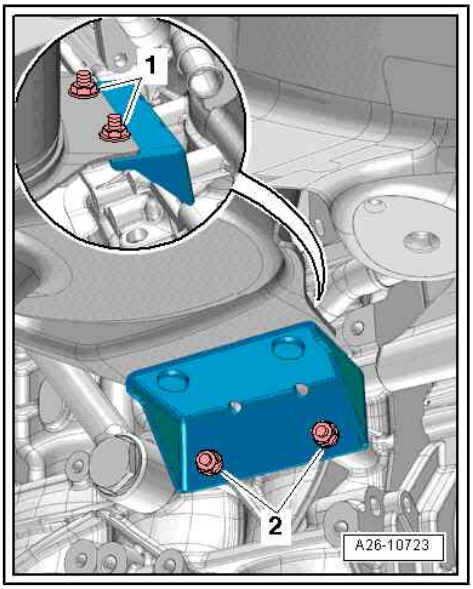
– Mark installation position of exhaust gas temperature sender 4 - G648- -item 1-.
– Unscrew exhaust gas temperature sender 4 - G648- from exhaust pipe behind particulate filter using a tool from tool set, 17 mm - T10395- .



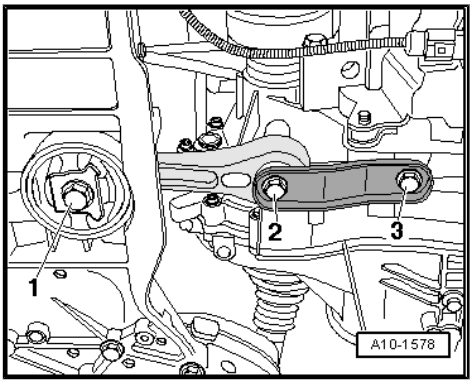
Note

Disregard -item 2-.

– Remove nuts -1- and detach bracket for particulate filter.



– Remove bolts -2- and -3- securing pendulum support.

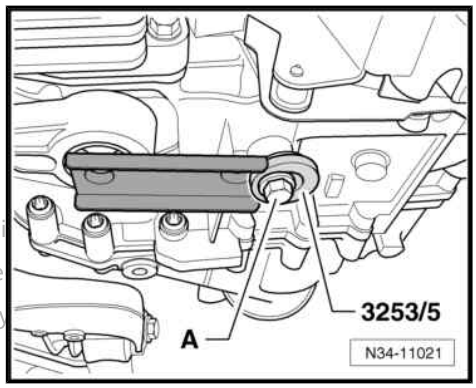


Note

Disregard -item 1-.

– Press engine/gearbox assembly towards lock carrier and support via pendulum support as shown in illustration.

A - Flange bolt M10x35



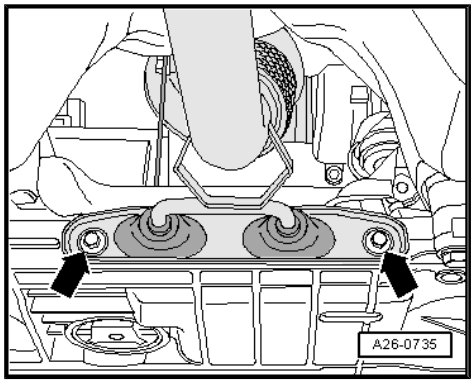
Caution

Risk of damage to flexible joint.

- ***Do NOT bend flexible joint in front exhaust pipe more than 10°.***

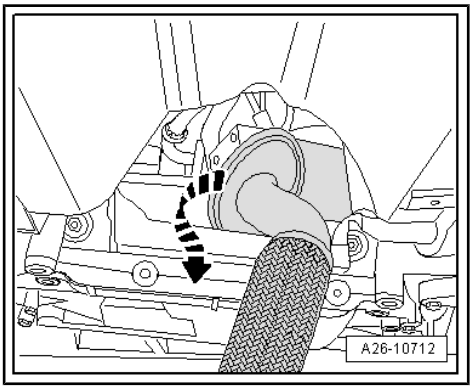
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– Remove bolts -arrows- securing bracket for exhaust system.



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– Remove particulate filter by rotating through 180° and about its own axis.



Installing

Installation is carried out in reverse order; note the following:

Tightening torques

- ⇒ “5.1 Exploded view - particulate filter and NOx storage catalytic converter”, page 317
- ⇒ “5.2 Exhaust flap control unit J883 with trap catalytic converter - exploded view”, page 320
- ⇒ “5.3 Exploded view - centre silencer”, page 321
- ⇒ “6.1 Exploded view - exhaust gas temperature control”, page 334

Note

- *Renew gaskets, self-locking nuts and clamp for particulate filter.*
- *Fit all cable ties in the original positions when installing.*
- *Attach exhaust gas temperature sender 4 in line with marking and secure.*

– Installation position of clamps on exhaust system ⇒ page 321 .

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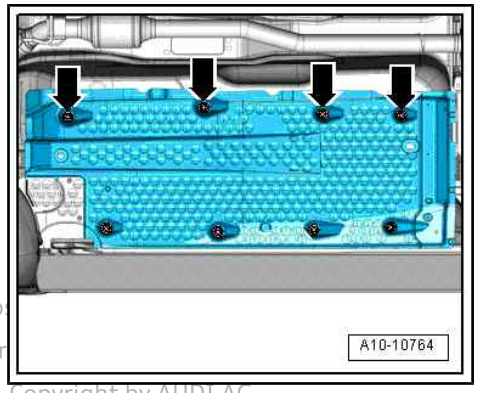
– Install filter ⇒ page 345 .
– Install underbody cover ⇒ Rep. gr. 66 .
– Install pendulum support ⇒ Rep. gr. 34 .
– Install drive shaft ⇒ Rep. gr. 40 .
– Install heat shield for drive shaft (right-side) ⇒ page 40 .
– Align the exhaust system so it is free of stress ⇒ page 332 .
– Install Lambda probe - G39- , exhaust gas pressure sensor 1 - G450- and pressure differential sender - G505- ⇒ Rep. gr. 23 .
– Learnt values must be adapted in engine control unit after particulate filter has been renewed.
– Switch on ignition and select following menu options on ⇒ Vehicle diagnostic tester:

- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics`
- `01 - Engine electronics, functions`
- `01 - Adapt particulate filter learnt values`

5.7 Removing and installing NOx storage catalytic converter

Removing

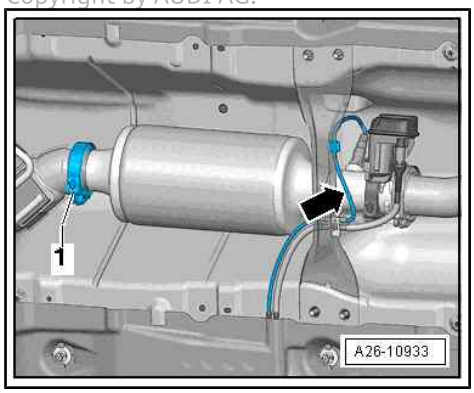
– Unscrew nuts -arrows- and pull underbody cover (right-side) down slightly.



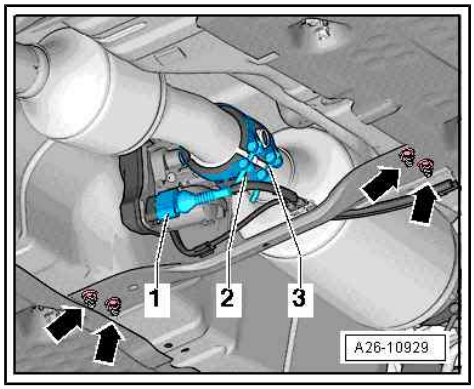
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– Unplug electrical connector -2- and move wiring clear.

– Loosen clamp -1-.



– Loosen clamp -3- and remove NOx storage catalytic converter.



Installing

Installation is carried out in reverse order; note the following:

Note

Note installation position of seal between exhaust flap control unit - J883- and NOx storage catalytic converter or trap catalytic converter. *⇒ page 320*

Check installation position of clamps
⇒ “5.4 Installation position of clamps on exhaust system”, page 321 .

– Learnt values must be adapted in engine control unit after NOx storage catalytic converter has been renewed.

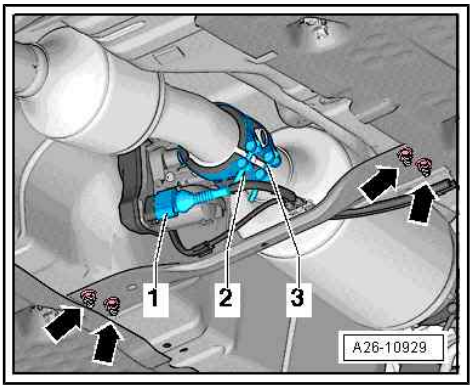
– Switch on ignition and select following menu options on ⇒ Vehicle diagnostic tester:

- `01 - Self-diagnosis compatible systems`
- `01 - Engine electronics`
- `01 - Engine electronics, functions`
- `01 - Reset learnt values`

Tightening torques

- ⇒ “5.1 Exploded view - particulate filter and NOx storage catalytic converter”, page 317

5.8 Removing and installing exhaust flap control unit - J883-



Removing

– Unplug electrical connector -1-.

– Loosen clamps -2- and -3-.

– Remove exhaust flap control unit - J883- .

Installing

Installation is carried out in reverse order; note the following:

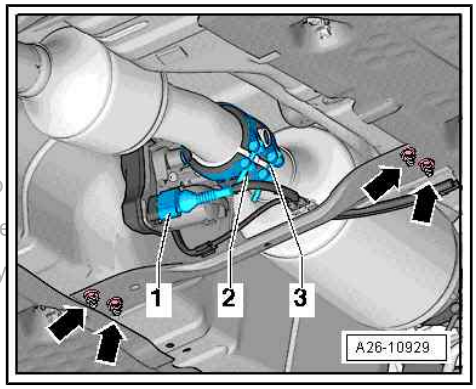
Note

Note installation position of seal between exhaust flap control unit - J883- and NOx storage catalytic converter or trap catalytic converter ⇒ page 320 .

⇒ “5.4 Installation position of clamps on exhaust system”, page 321

⇒ “5.11 Stress-free alignment of exhaust system”, page 332

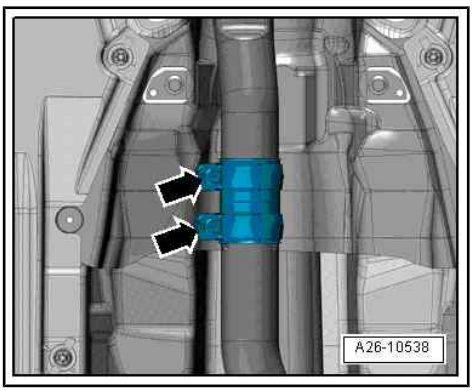
5.9 Removing and installing trap catalytic converter



Removing

– Loosen clamp -2-.

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– Loosen bolt connections -arrows- on clamp.

– Push clamp back and remove trap catalytic converter.

Installing

Installation is carried out in reverse order; note the following:

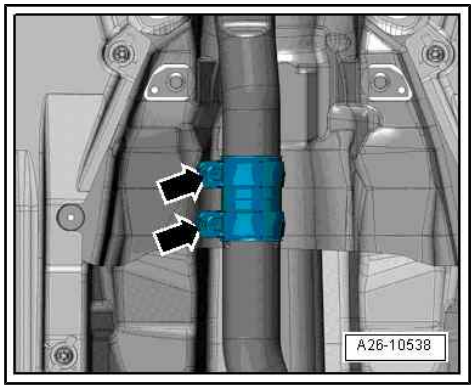
Note

Note installation position of seal between exhaust flap control unit - J883- and NOx storage catalytic converter or trap catalytic converter ⇒ page 320 .

⇒ “5.4 Installation position of clamps on exhaust system”, page 321

⇒ “5.11 Stress-free alignment of exhaust system”, page 332

5.10 Removing and installing centre silencer



Removing

– Loosen bolt connections -arrows- on clamp.

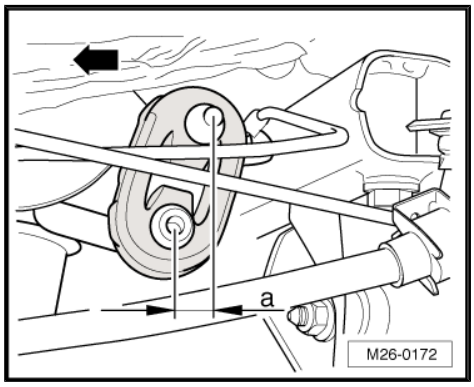
– Disengage centre silencer from mountings and remove centre silencer.

Installing

Installation is carried out in reverse order; note the following:

⇒ “5.11 Stress-free alignment of exhaust system”, page 332

5.11 Stress-free alignment of exhaust system

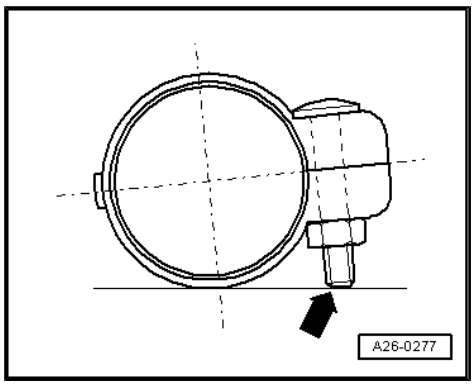


Procedure

- The exhaust system must be aligned when it is cool.
- Tightening torque
  ⇒ “5.1 Exploded view - particulate filter and NOx storage catalytic converter”, page 317

– Loosen bolted connections on front clamp.

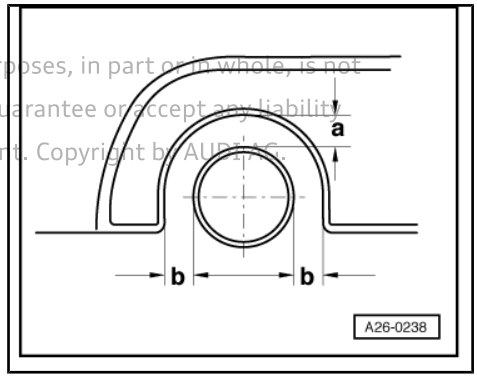
– Push exhaust system towards front of vehicle until preloading at mounting for rear silencer -a- = 15 ... 17 mm.



– Install clamp so that ends of bolts do not protrude beyond bottom of clamp -arrow-.

- Bolted connection facing towards right

5.12 Aligning tailpipe



– Align centre silencer so that there is an equal distance -a- and -b- between bumper cut-out and tailpipe.

– Tighten bolt connections on clamp evenly.

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5.13 Checking exhaust system for leaks

– Start the engine and run at idling speed.

– Plug tailpipes during leak test (e.g. with cloth or plug).
– Listen for noise at the connection points of cylinder head/exhaust manifold, turbocharger/front exhaust pipe etc. to locate any leaks.
– Rectify any leaks that are found.



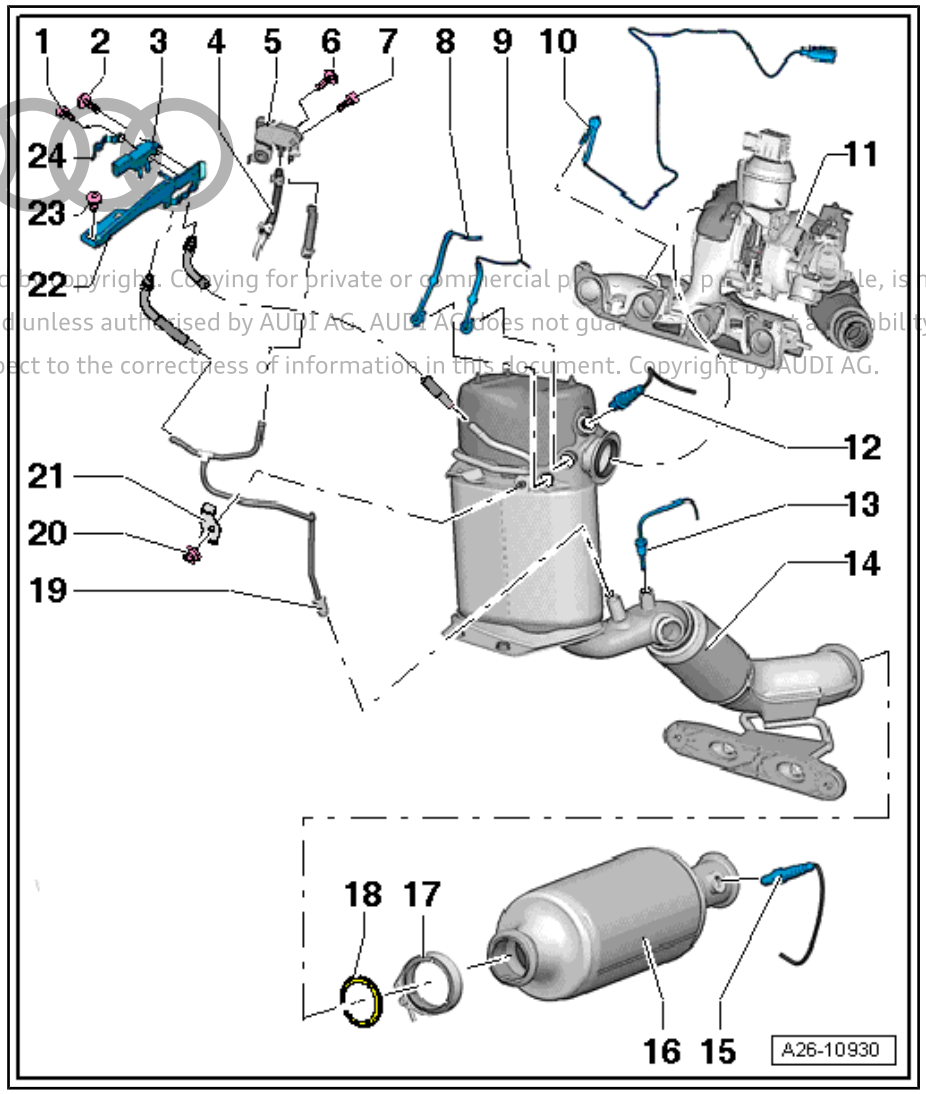
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6 Exhaust gas temperature control - vehicles with engine code CBEA

Overview

- ⇒ “6.1 Exploded view - exhaust gas temperature control”, page 334
- ⇒ “6.2 Removing and installing exhaust gas temperature sender 1 G235 ”, page 336
- ⇒ “6.3 Removing and installing exhaust gas temperature sender 2 G448 ”, page 337
- ⇒ “6.4 Removing and installing exhaust gas temperature sender 3 G495 ”, page 338
- ⇒ “6.5 Removing and installing exhaust gas temperature sender 4 G648 ”, page 341

6.1 Exploded view - exhaust gas temperature control



1 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

2 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

3 - Pressure differential sender - G505-

- ❑ Removing and installing ⇒ Rep. gr. 23

4 - Control pipe

- ❑ Control pipe from exhaust gas recirculation cooler to exhaust gas pressure sensor 1

5 - Exhaust gas pressure sensor 1 - G450-

- ❑ Removing and installing ⇒ Rep. gr. 23

6 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

7 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

8 - Exhaust gas temperature sender 3 - G495-

- ❑ 45 Nm
- ❑ Removing and installing ⇒ page 338
- ❑ Note installation position ⇒ page 336
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

9 - Exhaust gas temperature sender 2 - G448-

- ❑ 45 Nm

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- ❑ Removing and installing ⇒ page 337
- ❑ Note installation position ⇒ page 336
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

10 - Exhaust gas temperature sender 1 - G235-

- ❑ 45 Nm
- ❑ Before removing mark installation position
- ❑ Removing and installing ⇒ page 336
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue

11 - Turbocharger

12 - Lambda probe - G39- with Lambda probe heater - Z19-

- ❑ Removing and installing ⇒ Rep. gr. 23

13 - Exhaust gas temperature sender 4 - G648-

- ❑ 45 Nm
- ❑ Removing and installing ⇒ page 341
- ❑ Before removing mark installation position
- ❑ Coat with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue
- ❑ Routing of wire ⇒ page 322

14 - Particulate filter

15 - Lambda probe after catalytic converter - G130-

- ❑ Removing and installing ⇒ Rep. gr. 23
- ❑ Routing of wire ⇒ page 322

16 - NOx storage catalytic converter

- ❑ Removing and installing ⇒ page 330

17 - Clamp

18 - Seal

19 - Control pipe

- ❑ Tightening torque ⇒ Rep. gr. 23
- ❑ Do not attempt to bend control pipe to a different shape
- ❑ Install free of stress

20 - Nut

- ❑ 9 Nm

21 - Bracket

- ❑ For control pipe

22 - Bracket

- ❑ For pressure differential sender - G505-

23 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

24 - Bracket

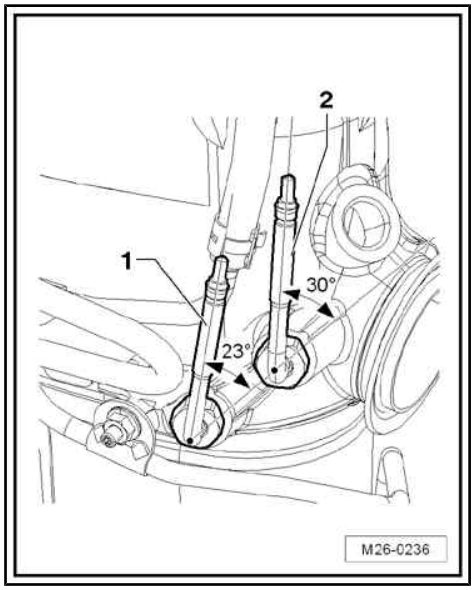
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Installation position of exhaust gas temperature senders

– Install exhaust gas temperature senders and make sure that angles are correct:

1 - Exhaust gas temperature sender 3 - G495- : angle -23°-

2 - Exhaust gas temperature sender 2 - G448- : angle -30°-



6.2 Removing and installing exhaust gas temperature sender 1 - G235-

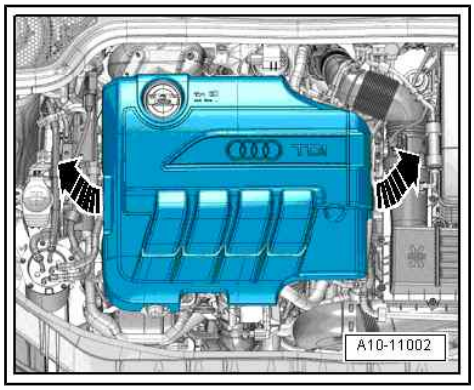
Special tools and workshop equipment required

♦ Crow foot wrench (commercially available)

Removing

– Remove filter ⇒ page 345 .

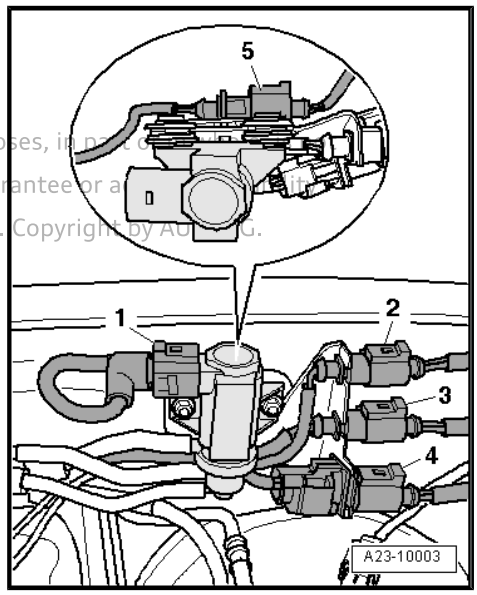
– Remove engine cover panel -arrows-.



– Unplug electrical connector -3- for exhaust gas temperature sender 1 - G235- and move electrical wiring clear.

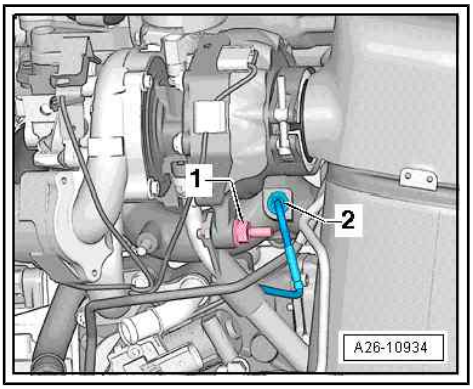
Note

Disregard -items 1, 2, 4, 5-.



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– Remove bolt -1-.
– Mark installation position of exhaust gas temperature sender 1 - G235- -item 2-.
– Unscrew exhaust gas temperature sender 1 - G235- -item 2- from exhaust manifold using a crow foot wrench.



Installing

Installation is carried out in reverse order; note the following:

Tightening torques

- ⇒ “6.1 Exploded view - exhaust gas temperature control”, page 334
- ⇒ “7.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 343

Check installation position of clamps
⇒ “5.4 Installation position of clamps on exhaust system”, page 321 .

Note

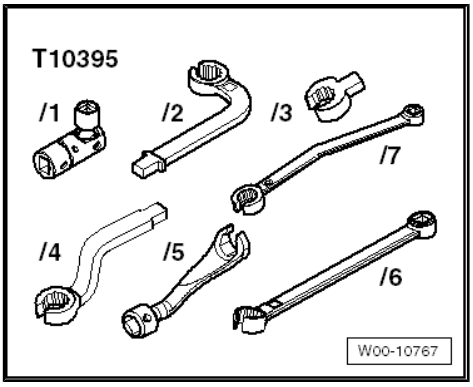
- *Coat threads of exhaust gas temperature sender with high-temperature paste; for high-temperature paste refer to ⇒ Electronic parts catalogue .*
- *Attach exhaust gas temperature sender 1 in line with marking and secure.*
- *Fit all cable ties in the original positions when installing.*

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6.3 Removing and installing exhaust gas temperature sender 2 - G448-

Special tools and workshop equipment required

- Tool set, 17 mm - T10395-

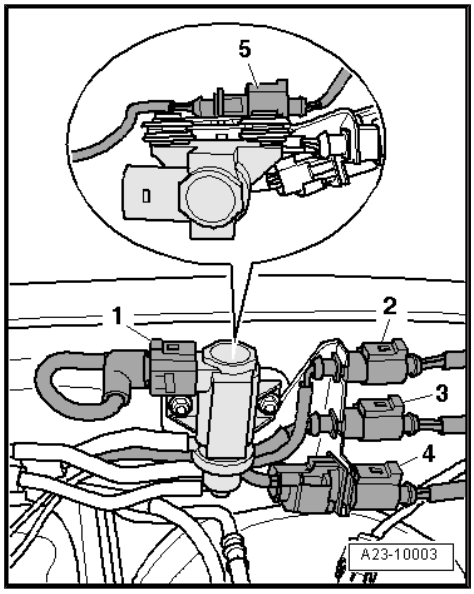


Removing

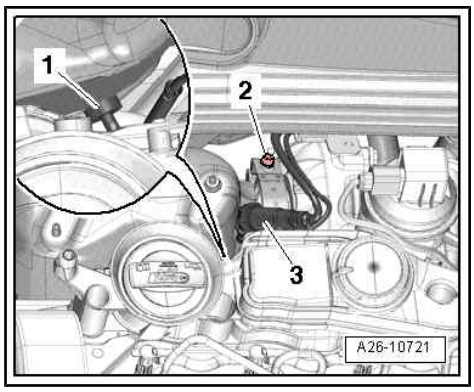
– Remove Lambda probe - G39- ⇒ Rep. gr. 23 .

– Remove exhaust gas pressure sensor 1 - G450- ⇒ Rep. gr. 23 .

– Unplug electrical connector -2- for exhaust gas temperature sender 2 - G448- and move electrical wiring clear.



– Unscrew exhaust gas temperature sender 2 - G448- -item 1- using a tool from tool set, 17 mm - T10395- .



Note

Disregard items -2 and 3-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torques

◆ ⇒ “6.1 Exploded view - exhaust gas temperature control”, page 334

Note

◆ *Coat threads of temperature sender with high-temperature paste ⇒ Electronic parts catalogue .*

◆ *Fit all cable ties in the original positions when installing.*

– Note installation position of exhaust gas temperature sender 2 - G448- ⇒ page 336 .

– Install Lambda probe - G39- ⇒ Rep. gr. 23 .

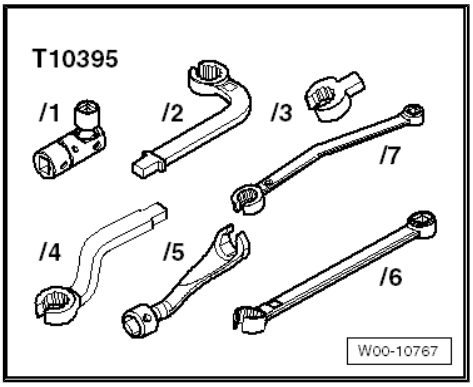
– Install exhaust gas pressure sensor 1 - G450- ⇒ Rep. gr. 23 .

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6.4 Removing and installing exhaust gas temperature sender 3 - G495-

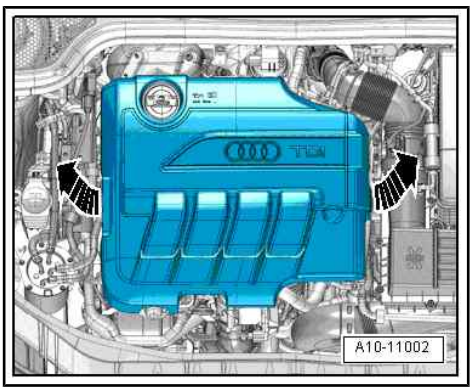
Special tools and workshop equipment required

♦ Tool set, 17 mm - T10395-



Removing

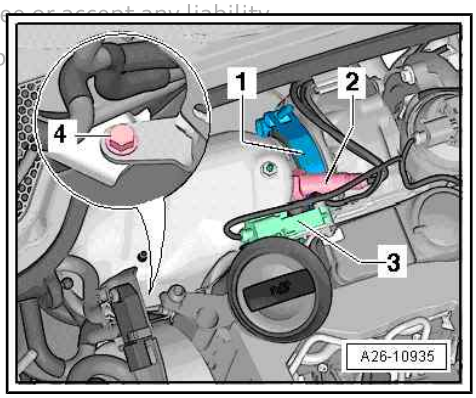
– Remove engine cover panel -arrows-.



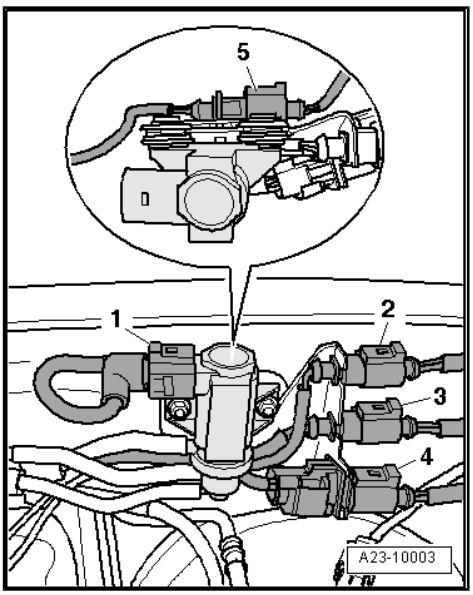
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– Detach heat insulation sleeve and remove exhaust gas pressure sensor 1 - G450- -3- ⇒ Rep. gr. 23 .

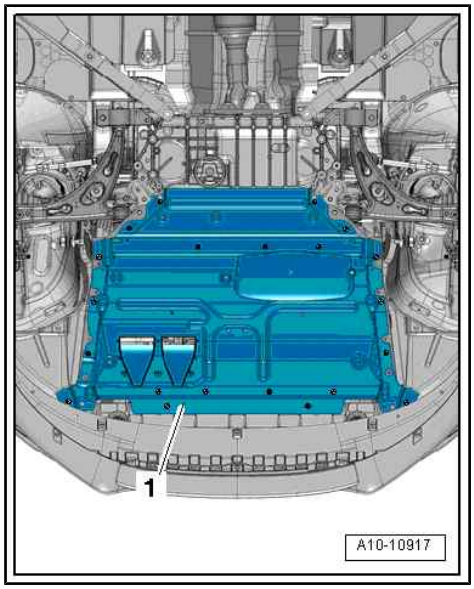
– Detach clamp -1-



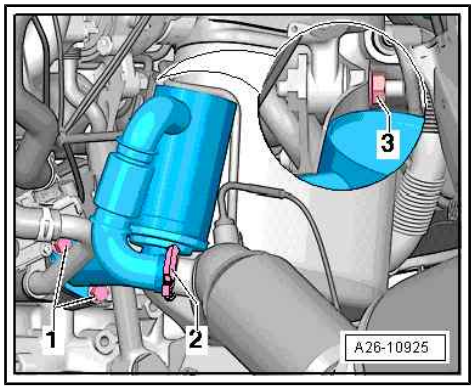
– Unplug electrical connector -5- for exhaust gas temperature sender 3 - G495- and move electrical wiring clear.



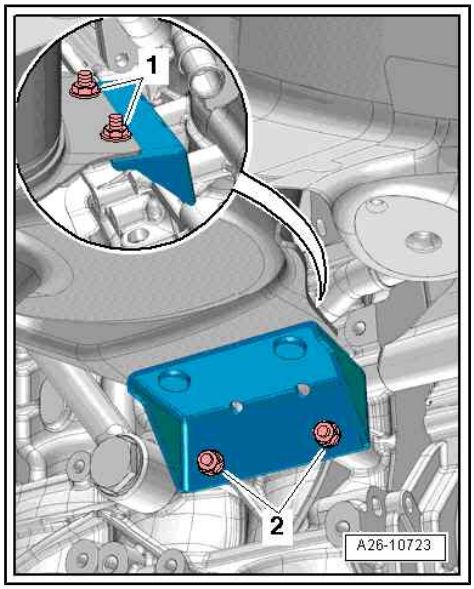
– Remove noise insulation -1- ⇒ Rep. gr. 50 .



– Detach clamp -2-



– Remove nuts -2-.

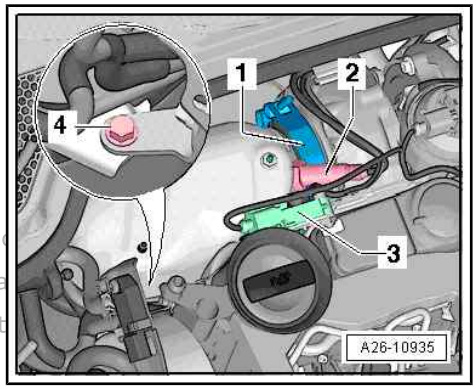


Note

Disregard -item 1-.

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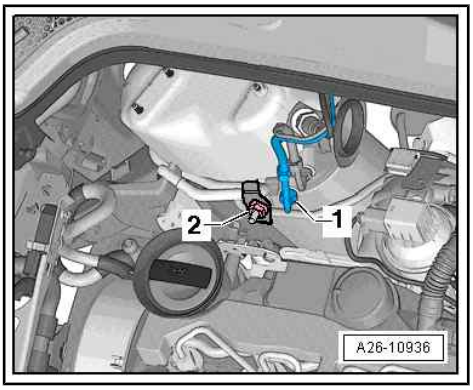
– Remove bolt -4- and move particulate filter towards rear.



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– Loosen nut -2-.

– Unscrew exhaust gas temperature sender 3 - G495- -item 1- using a tool from tool set, 17 mm - T10395- .



Installing

Installation is carried out in reverse order; note the following:

Tightening torques

- ⇒ “5.1 Exploded view - particulate filter and NOx storage catalytic converter”, page 317
- ⇒ “6.1 Exploded view - exhaust gas temperature control”, page 334

Note

- *Coat threads of temperature sender with high-temperature paste ⇒ Electronic parts catalogue .*
- *Fit all cable ties in the original positions when installing.*

– Note installation position of exhaust gas temperature sender 3 - G495- ⇒ page 336 .

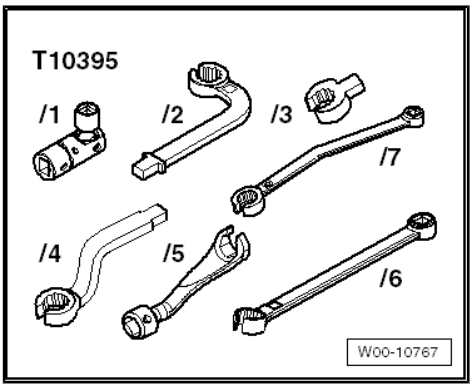
– Install exhaust gas pressure sensor 1 - G450- ⇒ Rep. gr. 23 .

– Install noise insulation ⇒ Rep. gr. 50 .

6.5 Removing and installing exhaust gas temperature sender 4 - G648-

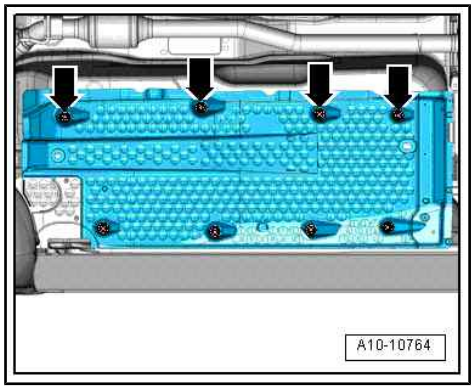
Special tools and workshop equipment required

- Tool set, 17 mm - T10395-



Removing

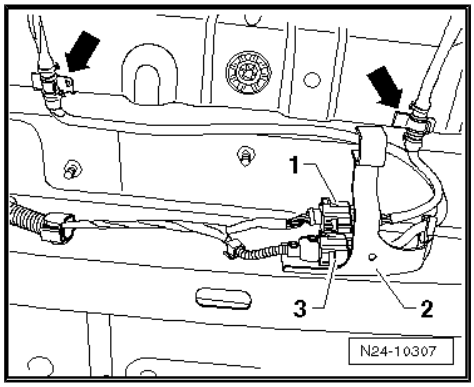
– Unscrew nuts -arrows- and pull underbody cover down slightly.



Note

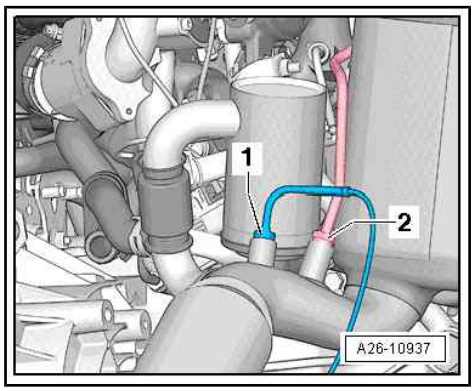
Note wire routing ⇒ page 323 .

– Unplug electrical connector »orange« for exhaust gas temperature sender 4 - G648- -1- and move electrical wiring clear.



– Mark installation position of exhaust gas temperature sender 4 - G648- -item 1-.

– Unscrew exhaust gas temperature sender 4 - G648- from exhaust pipe behind particulate filter using a tool from tool set, 17 mm - T10395- .



Note

Disregard -item 2-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torques

◆ ⇒ “6.1 Exploded view - exhaust gas temperature control”, page 334

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Note

Coat threads of temperature sender with high-temperature paste ⇒ Electronic parts catalogue .

7 Exhaust gas recirculation system - vehicles with engine code CBEA

Overview

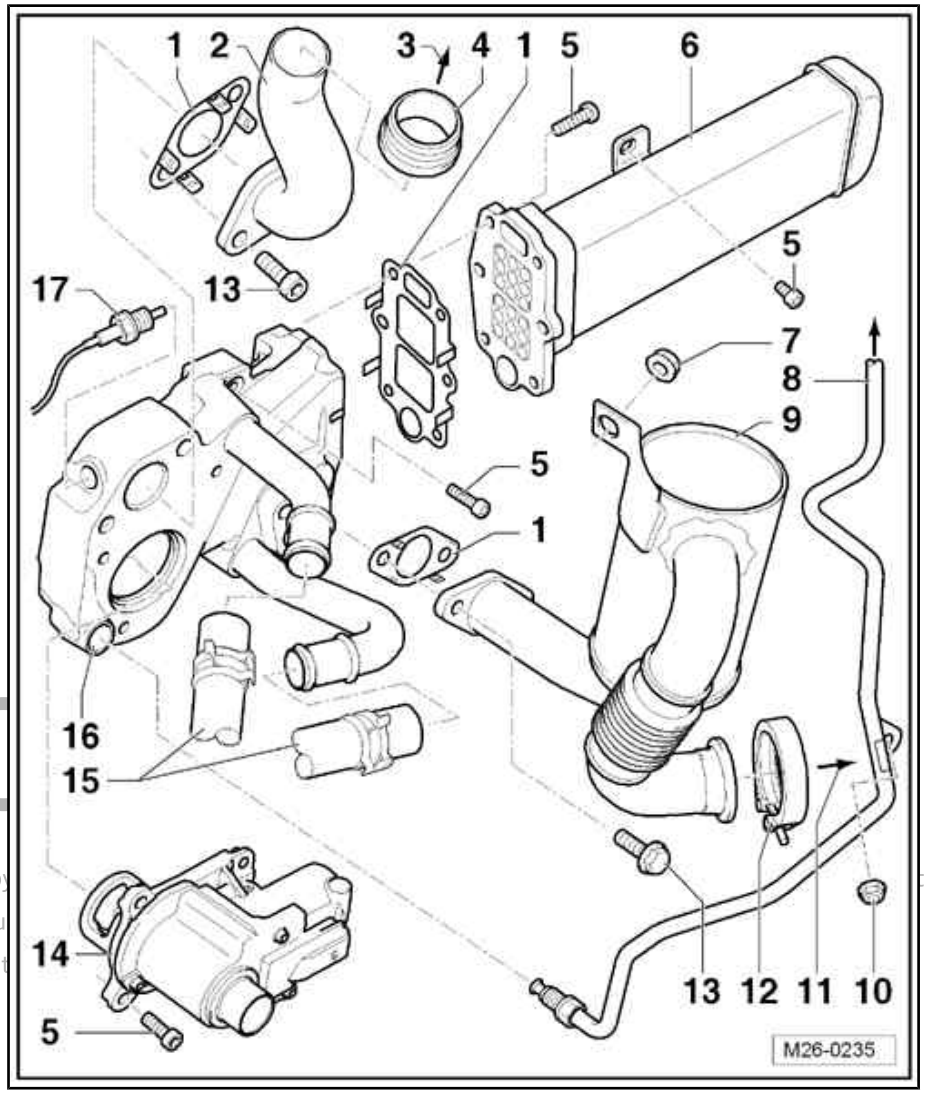
- ⇒ “7.1 Diagram of vacuum connections”, page 343
- ⇒ “7.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 343
- ⇒ “7.3 Removing and installing filter”, page 345
- ⇒ “7.4 Removing and installing housing with exhaust gas re-circulation cooler”, page 346
- ⇒ “7.5 Removing and installing exhaust gas recirculation control motor 2 V339 ”, page 349
- ⇒ “7.6 Removing and installing exhaust gas recirculation temperature sensor G98 ”, page 350
- ⇒ “7.7 Exploded view - exhaust gas recirculation control motor V338 with exhaust gas recirculation potentiometer G212 ”, page 352

7.1 Diagram of vacuum connections

⇒ “2.1 Diagram of vacuum connections”, page 251

7.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler

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1 - Gasket

- ❑ Renew
- ❑ Note installation position

2 - Connecting pipe

- ❑ To remove and install, loosen connection ⇒ Item 33 (page 255) on turbocharger as well

3 - To connection at turbocharger

- ❑ ⇒ Item 33 (page 255)

4 - Seal

- ❑ Renew if damaged

5 - Bolt

- ❑ 8 Nm

6 - Cooler

- ❑ For exhaust gas recirculation
- ❑ Removing and installing ⇒ page 346

7 - Nut

- ❑ 23 Nm
- ❑ Fitted on hexagon stud ⇒ Item 17 (page 254) on turbocharger

8 - Control pipe

- ❑ 23 Nm
- ❑ Do not attempt to bend control pipe to a different shape
- ❑ To exhaust gas pressure sensor 1 - G450-
- ❑ Install free of stress

9 - Filter

- ❑ For exhaust gas recirculation
- ❑ Removing and installing ⇒ page 345

10 - Nut

- ❑ 23 Nm

11 - To particulate filter

12 - Clamp

- ❑ 3.5 Nm
- ❑ Renew
- ❑ Note installation position ⇒ page 321

13 - Bolt

- ❑ 23 Nm

14 - Exhaust gas recirculation control motor 2 - V339-

- ❑ With exhaust gas recirculation potentiometer 2 - G466-
- ❑ Removing and installing ⇒ page 349
- ❑ Before removing mark installation position
- ❑ Thoroughly clean hole at valve and at housing before installing, lubricate lightly with oil if necessary.

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- ❑ Adaption must be performed after renewal: allow engine to run for 1 minute, switch off engine and switch off ignition for 5 minutes

15 - Coolant hose

- ❑ Check for firm attachment
- ❑ Connection diagram - coolant hoses ⇒ page 192

16 - Housing

- ❑ For exhaust gas recirculation
- ❑ Removing and installing ⇒ page 346

17 - Exhaust gas recirculation temperature sensor - G98-

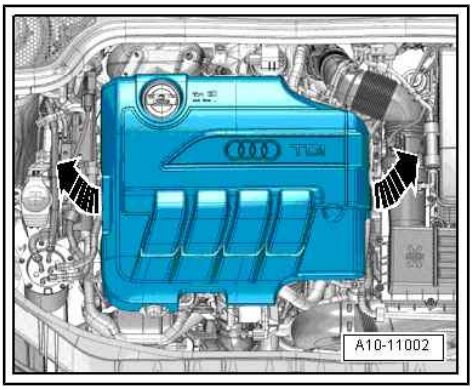
- ❑ 20 Nm
- ❑ Removing and installing ⇒ page 350
- ❑ In case of damage or leakage, cut open seal and renew
- ❑ Always observe tightening torque

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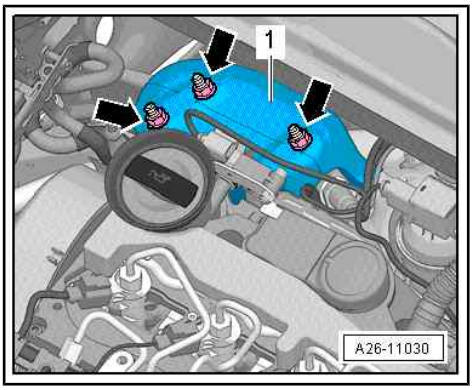
7.3 Removing and installing filter

Removing

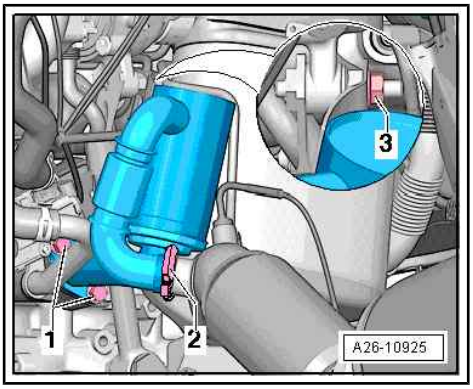
– Remove engine cover panel -arrows-.



– Unscrew nuts -arrows- and detach heat shield -1-.



– Remove nut -3-.

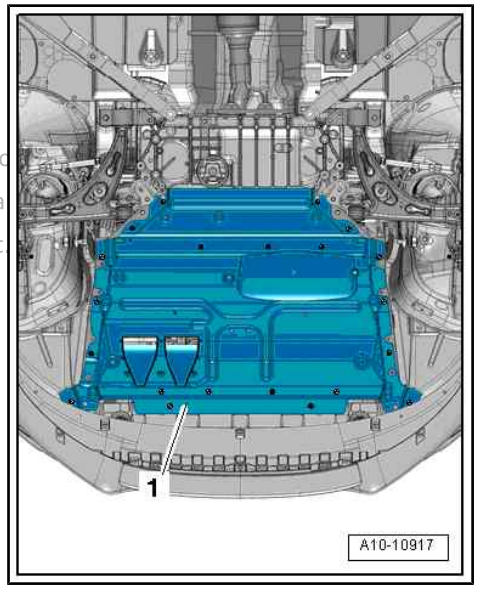


Note

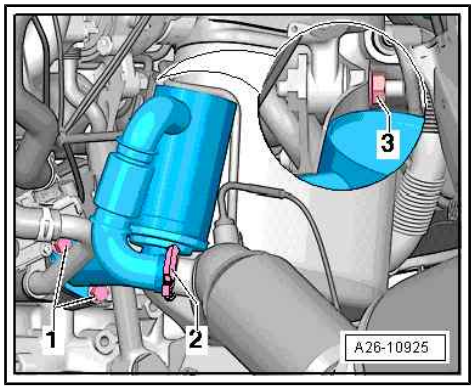
Nut -3- is accessible from above.

– Remove noise insulation -1- ⇒ Rep. gr. 50 .

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– Detach clamp -2-, unscrew bolts -1- and take out filter.



Installing

Installation is carried out in reverse order; note the following:

Tightening torques

- ⇒ “7.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 343

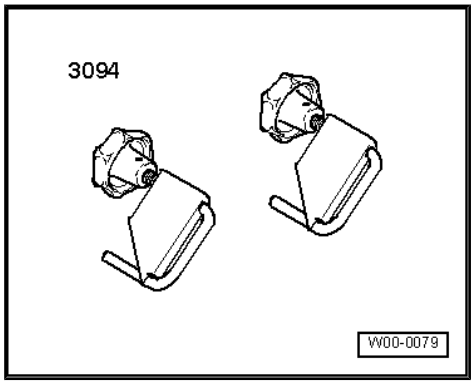
Check installation position of clamps
⇒ “5.4 Installation position of clamps on exhaust system”, page 321 .

– Install noise insulation ⇒ Rep. gr. 50 .

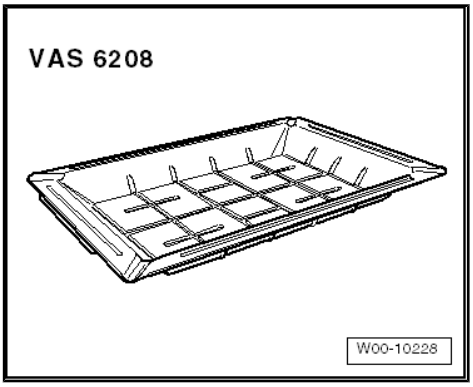
7.4 Removing and installing housing with exhaust gas recirculation cooler

Special tools and workshop equipment required

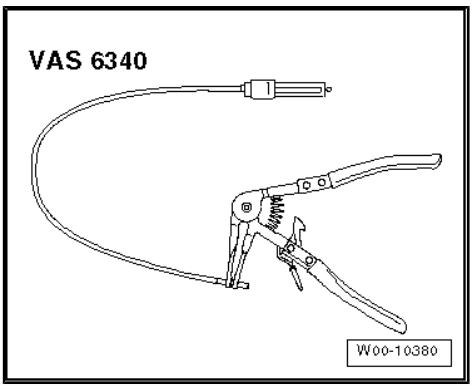
- Hose clamps up to 25 mm - 3094-



♦ Drip tray for workshop hoist - VAS 6208-



♦ Hose clip pliers - VAS 6340-

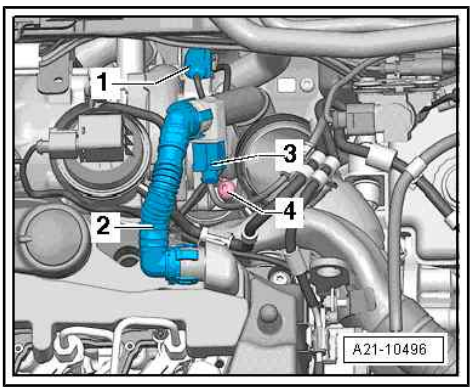


♦ Crow foot wrench (commercially available)

Removing

– Remove particulate filter ⇒ page 324 .

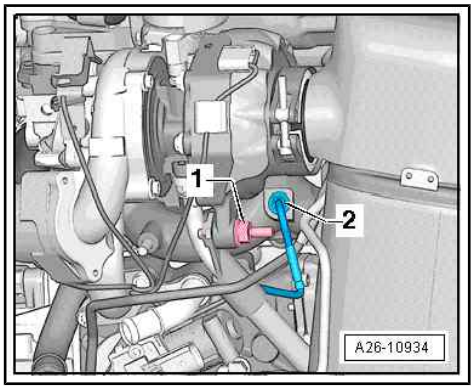
– Unplug electrical connector -1- on exhaust gas temperature sensor - G98- .



– Remove bolt -1-.

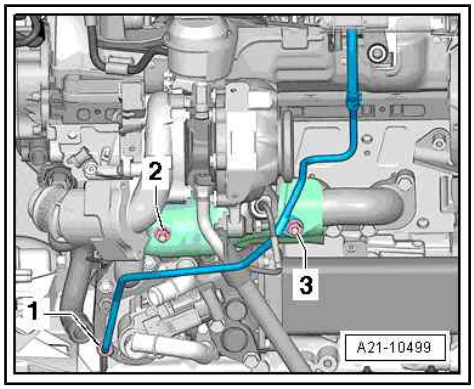
– Mark installation position of exhaust gas temperature sender 1 - G235- -item 2-.

– Unscrew exhaust gas temperature sender 1 - G235- -item 2- from exhaust manifold using a crow foot wrench.

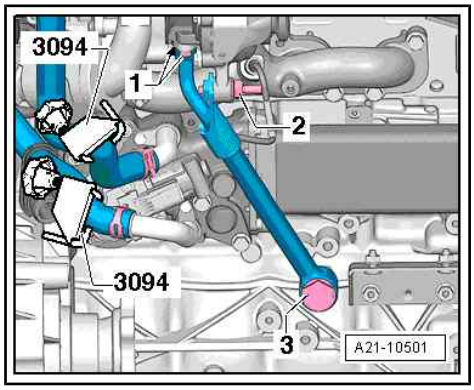


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– Remove nut -3- and bolt -1- and take out control pipe.



– Remove bolts -1-.
– Remove banjo bolt -3- and detach support for turbocharger with oil return pipe.
– Clamp off coolant hoses with hose clamps up to 25 mm - 3094- as shown in illustration.



WARNING

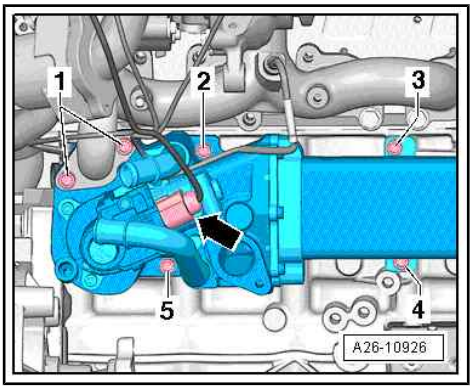
Risk of scalding due to hot steam and hot coolant.

- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

– Detach coolant hoses from housing for exhaust gas recirculation.

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– Unscrew bolts -1-, detach exhaust gas recirculation pipe and remove.
– Unplug electrical connector -arrow-.
– Remove bolts -2- to -5- and take out housing with exhaust gas recirculation cooler.
– Detach exhaust gas recirculation cooler from housing.



Installing

Installation is carried out in reverse order; note the following:

Tightening torques

♦ ⇒ “7.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 343

Note

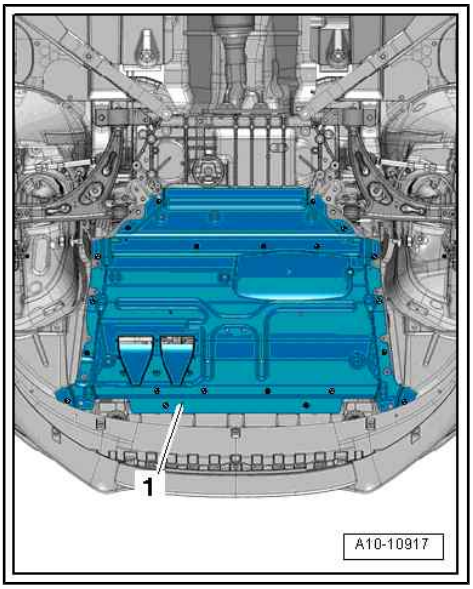
♦ *Renew gaskets, seals and self-locking nuts.*
♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
♦ *Fit heat insulation sleeve in the original position when installing.*

– Install support for turbocharger ⇒ page 253 .
– Install air cleaner housing ⇒ Rep. gr. 23 .
– Install particulate filter ⇒ page 324 .
– Check coolant level ⇒ page 204 .

7.5 Removing and installing exhaust gas recirculation control motor 2 - V339-

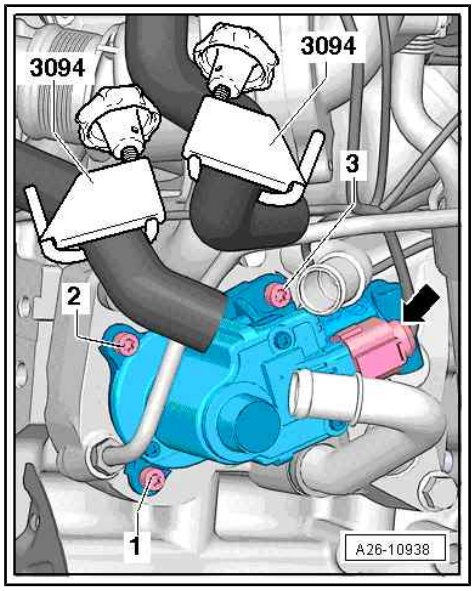
Removing

– Remove noise insulation -1- ⇒ Rep. gr. 50 .



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– Clamp off coolant hoses with hose clamps up to 25 mm - 3094- as shown in illustration.



WARNING

Risk of scalding due to hot steam and hot coolant.

- *The cooling system is under pressure when the engine is hot.*
- *To allow pressure to dissipate, cover filler cap on coolant expansion tank with cloth and open carefully.*

– Unplug electrical connector -arrow-.

– Remove bolts -1-, -2- and -3-, detach exhaust gas recirculation control motor 2 and remove.

Installing

Installation is carried out in reverse order; note the following:

Tightening torques

- ⇒ “7.7 Exploded view - exhaust gas recirculation control motor V338 with exhaust gas recirculation potentiometer G212 ”, page 352

Note

Renew O-ring.

– Install noise insulation ⇒ Rep. gr. 50 .

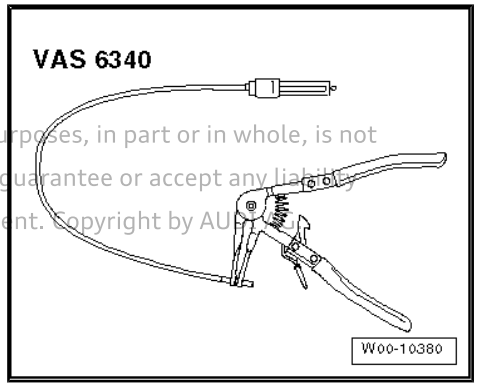
– Check coolant level ⇒ page 204 .

– Adaption must be performed after renewing exhaust gas re-circulation control motor 2 : allow engine to run for 1 minute, switch off engine and switch off ignition for 5 minutes.

7.6 Removing and installing exhaust gas re-circulation temperature sensor - G98-

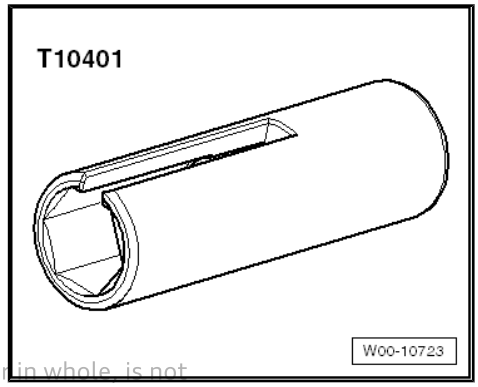
Special tools and workshop equipment required

- Hose clip pliers - VAS 6340-



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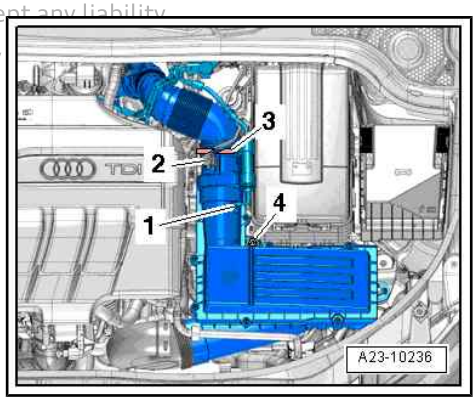
♦ Socket, 14 mm - T10401 -



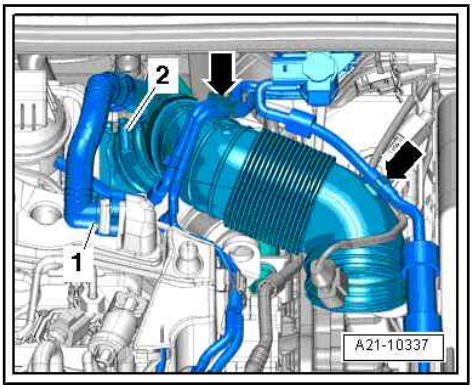
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Removing

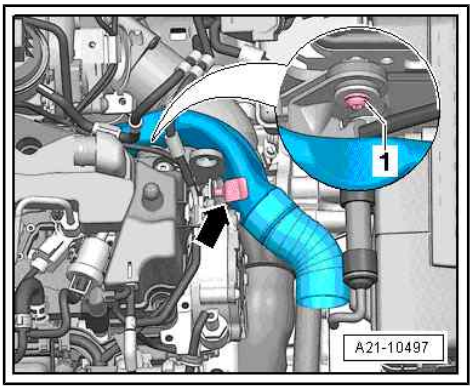
– Remove air cleaner housing ⇒ Rep. gr. 23 .



– Move clear vacuum hoses -arrows- at air pipe.
– Loosen hose clip -2- and detach air pipe.

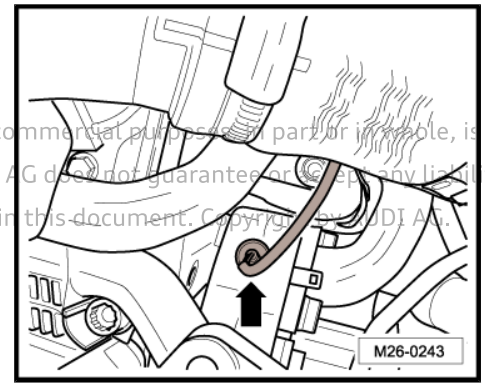


– Remove bolt -1- and detach warm air collector plate -arrow-.

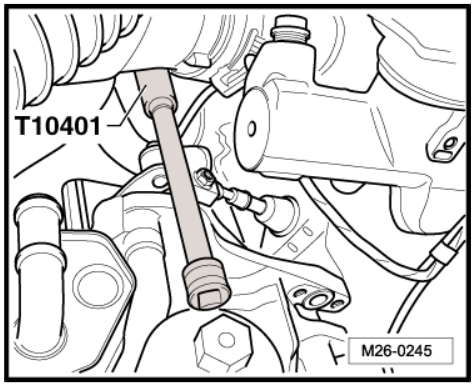


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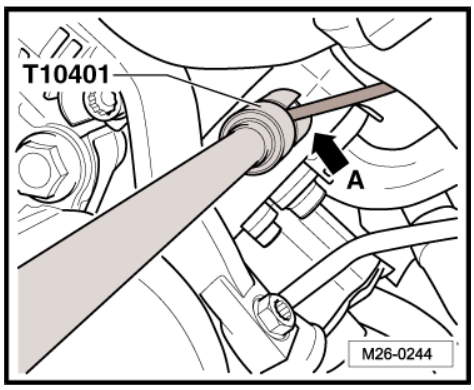
Illustration shows exhaust gas temperature sensor - G98- located below master brake cylinder at gearbox end -arrow- as seen from engine compartment.



– Carefully fit socket, 14 mm - T10401 - (with a ratchet extension) onto exhaust gas recirculation temperature sensor - G98- .



– Make sure that cable of exhaust gas recirculation temperature sensor - G98- is guided into groove on socket, 14 mm - T10401 - -arrow A-.



– Release and remove exhaust gas recirculation temperature sensor - G98- .

Installing

Installation is carried out in reverse sequence.

Tightening torques

♦ ⇒ “7.2 Exploded view - exhaust gas recirculation with exhaust gas recirculation cooler”, page 343

7.7 Exploded view - exhaust gas recirculation control motor - V338- with exhaust gas recirculation potentiometer - G212-

1 - Intake manifold

- ❑ Removing and installing ⇒ Rep. gr. 23

2 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

3 - Gasket

- ❑ Renew

4 - Seal

- ❑ Renew

5 - Pipe

- ❑ To exhaust gas recirculation cooler

6 - Bolt

- ❑ 20 Nm

7 - Gasket

- ❑ Renew

8 - Bolt

- ❑ 10 Nm

9 - Throttle valve module - J338-

10 - Bolt

- ❑ Tightening torque ⇒ Rep. gr. 23

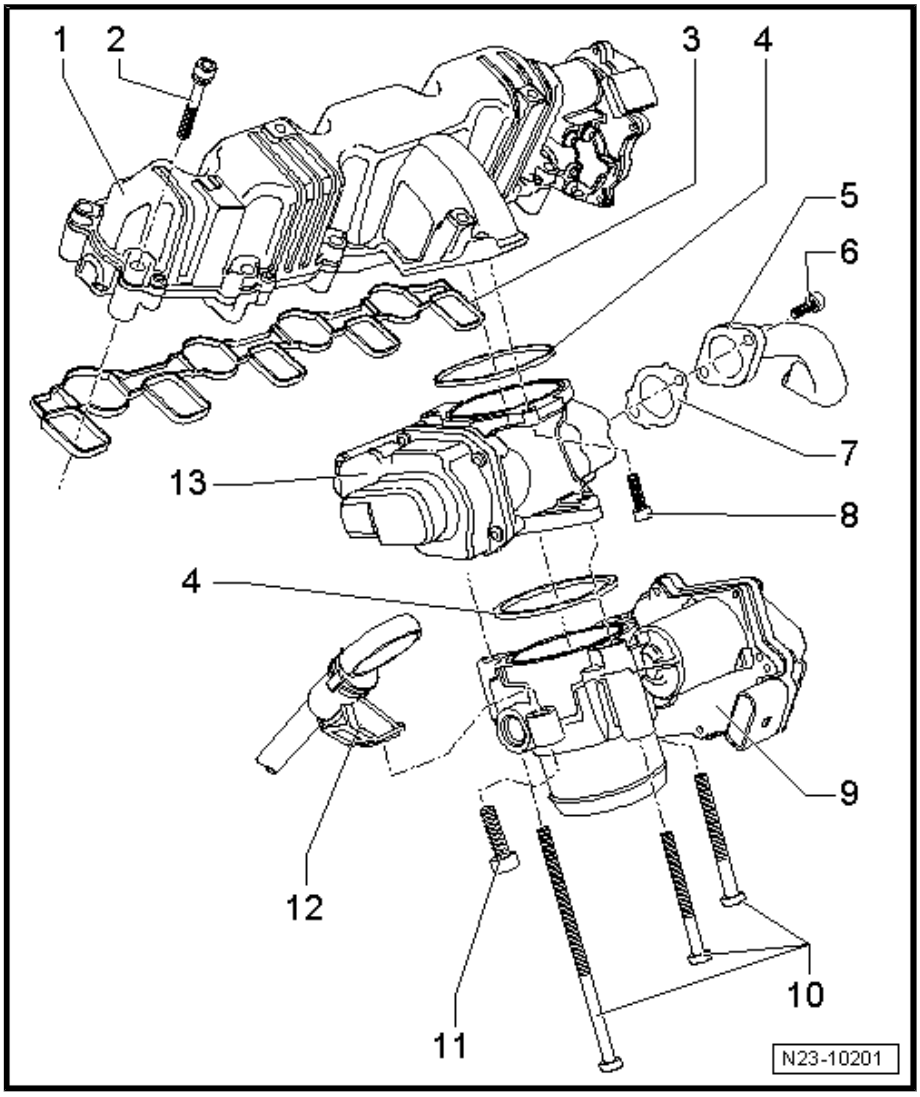
11 - Bolt

- ❑ 10 Nm

12 - Dipstick guide tube

13 - Exhaust gas recirculation control motor - V338- with exhaust gas recirculation potentiometer - G212-

- ❑ Adaption must be performed after renewing exhaust gas recirculation control motor - V338- : allow engine to run for 1 minute, switch off engine and switch off ignition for 5 minutes

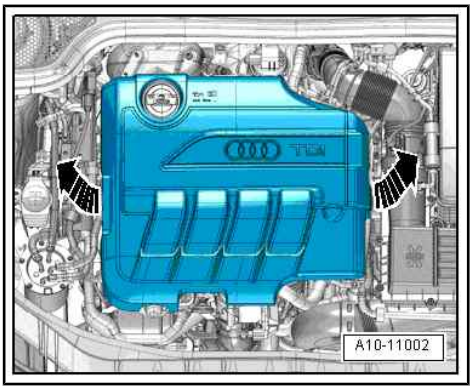


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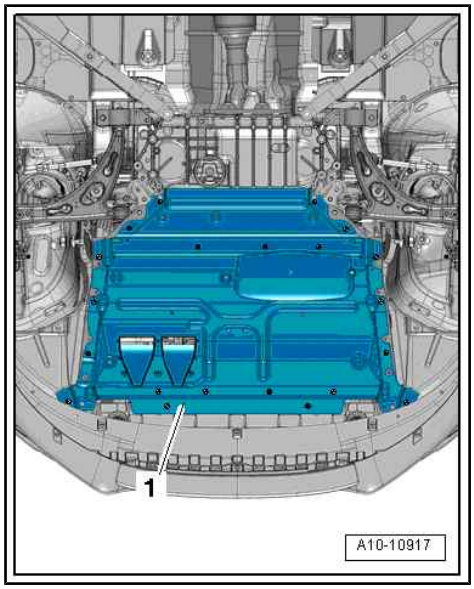
7.8 Removing and installing exhaust gas recirculation control motor - V338- with exhaust gas recirculation potentiometer - G212-

Removing

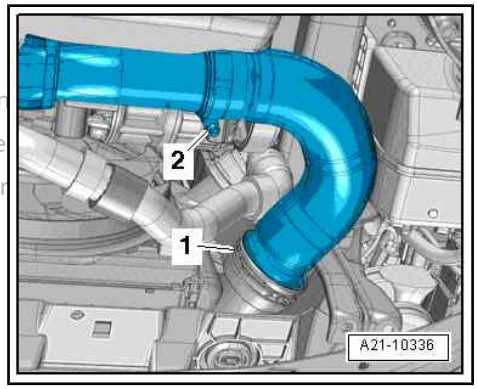
– Remove engine cover panel -arrows-.



– Remove noise insulation -1- ⇒ Rep. gr. 50 .

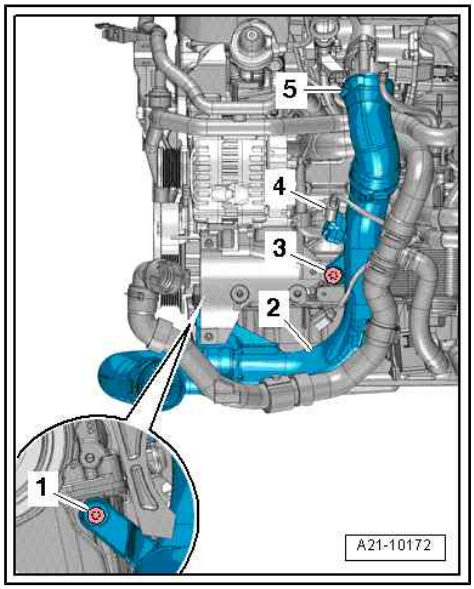


– Release hose clip -2-, lift retaining clip -1- and remove air hose.



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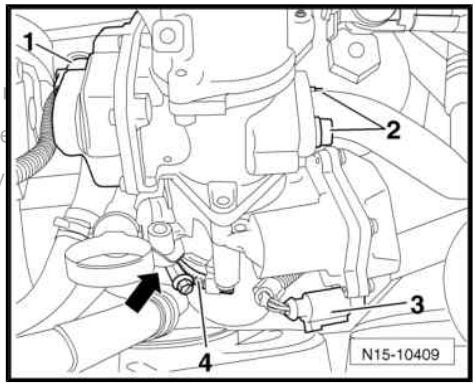
– Remove bolts -1- and -3-.
– Loosen hose clip -5- at throttle valve module - J338- , detach air pipe -2-, but leave in position.



Note

Disregard -item 4-.

– Unplug electrical connector -3-.

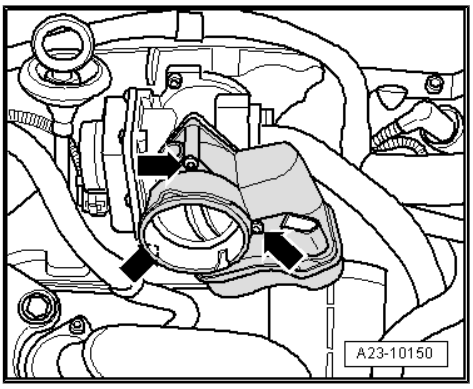


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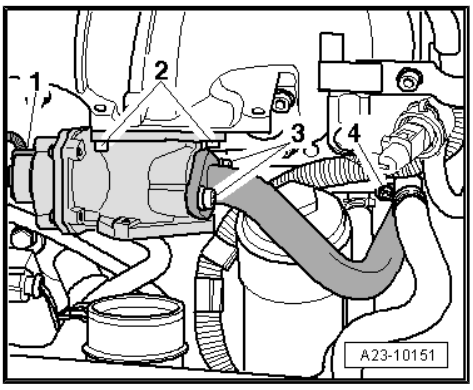
Note

Disregard -items 1, 2, 4- and -arrow-.

– Unscrew bolts -arrows- and detach throttle valve module - J338- .



– Unplug electrical connector -1- at exhaust gas recirculation control motor - V338- .
– Remove bolts -2- and -3- and detach exhaust gas recirculation control motor - V338- .



Note

Disregard -item 4-.

Installing

Installation is carried out in reverse order; note the following:

Tightening torques

◆ ⇒ “7.7 Exploded view - exhaust gas recirculation control motor V338 with exhaust gas recirculation potentiometer G212 ”, page 352

Note

Renew O-ring.

– Install throttle valve module - J338- ⇒ Rep. gr. 23 .
– Install air pipe ⇒ page 268 .
– Install air hose with plug-in connector ⇒ page 270 .
– Install noise insulation ⇒ Rep. gr. 50 .
– Adaption must be performed after renewing exhaust gas re-circulation control motor - V338- : allow engine to run for 1 minute, switch off engine and switch off ignition for 5 minutes.